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Vol. 3 No. 36 (new series) DECEMBER, 1957

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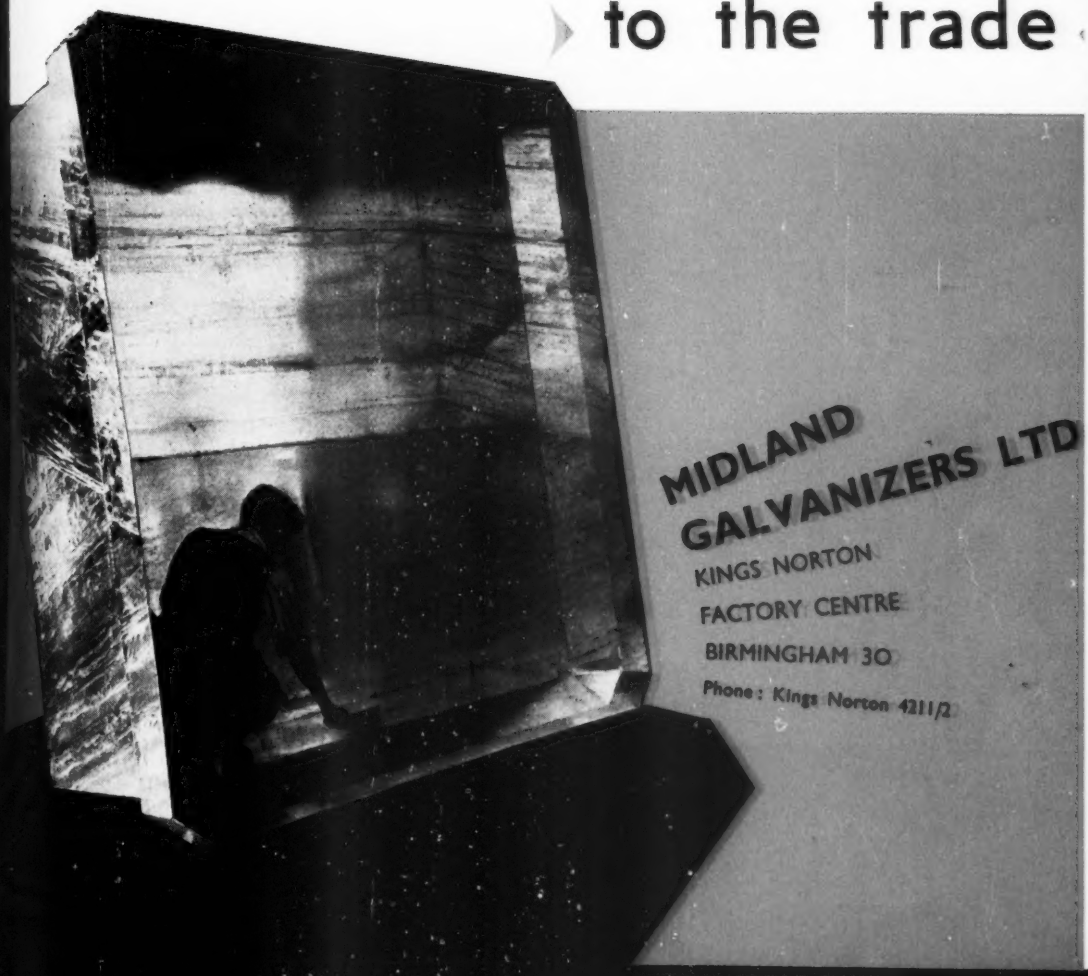

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metal finishing Journal

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THIS JOURNAL IS DEVOTED TO THE SCIENCE AND TECHNOLOGY OF PAINT APPLICATION, ELECTRODEPOSITION, VITREOUS ENAMELLING, GALVANIZING, ANODIZING, METAL SPRAYING & ALL METAL FINISHING PROCESSES. THE EDITOR IS PREPARED TO CONSIDER FOR PUBLICATION ANY ARTICLE COMING WITHIN THE PURVIEW OF "METAL FINISHING JOURNAL" AND ALL SUCH ARTICLES ACCEPTED WILL BE PAID FOR AT THE USUAL RATES.

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FORMULAE, FEARS AND FACTS

THE recent Annual Meeting of the Institute of Metal Finishing was the occasion of a spirited and witty address from its newly elected President, who took as his theme the subject of the future of metal finishing. The new President had a great deal that was pertinent to say concerning the somewhat depressing picture presented by the present state of research in the science of metal finishing.

Any improvement which can be hoped for in this connexion must be of a somewhat long-term nature and, must also depend on the extent to which funds can be made available for the initiation of research programmes. Undoubtedly the future prosperity of the metal-finishing industry in this country must depend on the rate at which the underlying fundamental knowledge relating to the various finishing processes is developed and extended, and we make no apology for referring again on this page to the need for a much greater degree of research consciousness among those engaged in the production and use of metal-finishing processes.

Such action is for the future, and, perhaps even the distant future. There is however, a sphere of development, referred to by the new President, in which immediate and fruitful action could be taken at no great expense. This lies in extending the degree of frankness and co-operation existing between the manufacturers and merchants of finishing supplies and processes on the one hand and the users and appliers of these processes and materials on the other.

The attempt to impose and maintain a blanket of secrecy and security covering the constituents and formulae of a large number of metal-finishing materials is today almost unique to this industry. It cannot surely be maintained by the purveyors of these processes that their constituents can be kept secret for more than a few days from anyone who for any reason is genuinely determined to identify them. In fact, the attempt to preserve the anonymity of "Brightener B" when the whole atmosphere of the nickel plating shop is heavily laden with the characteristic aroma of coumarin degenerates into something approaching farce.

There is also ample evidence to dispose of the suggestion that once formulae were published every jobbing plater or painter would have a chemical laboratory and a compounding warehouse at the back of his shop where he would carefully and expensively plagiarize the proprietary products of his erstwhile suppliers. Such a state of affairs has never come to pass in any other branch of industry where complete frankness concerning such matters is accepted without question.

All this is not to suggest that finishing supply houses should immediately lay bare the innermost secrets of their craft. There must remain matters of know-how, experience and tricks of the trade which are the real assets of any company and in any case largely incommunicable. Successful marketing in the competitive metal finishing supply field must depend not only on an efficient product, but also on the extent and quality of the company's research, service and sales facilities. From the point of view of the prosperity of the finishing industry these last are of greater and more permanent benefit than is the availability of a vast caucus of different processes and materials concealing their identities and virtues under the meaningless cloak of a number or an alphabetical symbol.

Talking Points

by "PLATELAYER"

TOPICAL COMMENT FROM THE MAIN LINES AND SIDE LINES OF METAL FINISHING

LIQUID ASSET

POLISHING is one of the oldest and certainly one of the most conservative of metal-finishing techniques. Basically polishing compositions and polishing wheels have hardly changed this century, although of course there have been great strides in mechanizing the operations themselves. Liquid polishing compounds represent perhaps the most important advance in this field, but although they have now been available for a good number of years, they are only now beginning to arouse real interest. Partly this is because their make-up has changed since the early days, when they were based on inflammable liquids which caused some very unpleasant fires. Now they are non-inflammable aqueous emulsions of such a high viscosity that the abrasive content does not settle even on prolonged standing.

The demand for liquid polishing compounds is really being created by the advent of automatic polishing machinery. Applicators for bar compounds are cumbrous and wasteful devices, and stopping machines frequently to replace a bar nubbin results in a serious loss of production which is completely obviated by the use of liquid compositions. The latter can also be cheaper in use, and are certainly easier to remove after polishing and prior to plating.

In the case of hand polishing there are still some obstacles to the use of the more wide-spread of liquid polishing compositions. One is the need for a different gun to spray each compound onto the buff when more than one is needed. The other is that some spray is thrown off each time the polish is applied to the wheel — and polishers don't like it !

IRON WITHOUT FIRE

QUITE unobtrusively, a good deal of work is going on behind the scenes on entirely new ways of making steel more simply and cheaply. Continuous casting is one method which is making considerable strides, and another is the reduction of iron ore to the metal powder, followed by sintering and rolling. A process which received some publicity about four years ago was an electrolytic one patented by the Sulfide Ore Process Co. in the U.S.A. about which nothing has been heard since, although it was said at the time that a pilot plant had been working for two years. This consisted in dissolving iron sulphide ore (pyrrhotite) in acid to produce an iron chloride electrolyte which was purified and from which the iron was then deposited on to stainless steel cathodes, resulting in a pure malleable iron sheet which was subsequently stripped off. The anodes were of graphite surrounded by diaphragms. It was claimed that deposits of .002 to 0.25 ins. in thickness up to 3 ft. x 4 ft. could be produced at low cost with a thickness variation of not more than 5 per cent. The sheet was said to be particularly suitable for transformer laminations, and also for severe forming operations on account of its purity and malleability.

FREEDOM OF CHOICE

IT is a surprising fact that in this country there is only one primary producer of each of four of the essential chemicals used in electroplating, *viz.*, nickel salts, sodium cyanide, chromic acid and trichlorethylene.

While no-one would deny that the producers concerned are efficient and treat their customers fairly, it is difficult to feel entirely happy about such a position. Even if the prices and availability of these products seem satisfactory no-one can be sure that the situation might not change at any time.

What can be done about it, if anything, is another matter. Probably alternative sources of supply will only become available when the European Common Market develops.

STRANGE

ALL the critics seem to agree that most of the chromium plating on motor cars is crude, tawdry and unnecessary ; it is also poor in quality and rusts in no time. But all the new motor cars carry as much chromium plate as ever, and curiously enough, they are being bought in greater numbers than ever.

Whether we like it or not chromium plate is particularly suitable for the bright work on motor-cars. Its brilliance and colour set off the appearance of a car in a way which is not easily matched.

A few years ago it will be remembered, the manufacturer of a popular small car attempted to produce a version from which these "trimmings" had been omitted. The result was that a number of enterprising small firms proceeded to supply suitable chromium plated parts to make good the deficiency. They did so well, that in a short time the car manufacturer decided to change his policy, and put them on himself after all.

Some Aspects of ZINC, COPPER, NICKEL and CHROMIUM PLATING

By L. ADES *

(A Paper presented to the Distributors' Conference organized by the Electro-Chemical Engineering Co. Ltd., at Weybridge, October 2, 3 and 4, 1957)

IT is proposed in this paper to present short accounts of a number of subjects instead of a study of one special subject, as it was thought that this method offered several advantages ; *e.g.:*

1. To report on a part of the activities of the author's technical department during the last two years ; and
2. To disseminate, in a short time, the maximum amount of new knowledge which the company have been able to acquire during this period of time.

I. ZEROMIST

Some years ago, published data showed that the introduction of surface-active agents of any sort in to a chrome solution caused a reduction in the throwing power of the solution. Since that time it has been shown that the surface-active agent decomposes on contact with chromic acid giving trivalent chromium ions, and it is the increase in these ions which reduces the throwing power.

In a study recently carried out, Georges Rousselot has also shown that the reduction of the throwing power or the increase of the covering power, that is to say of the minimum current density at which the chromium deposit begins to form only takes place when the quantity of trivalent chrome exceeds 20 gm. per litre, a content which is clearly unusual.

The number of technicians who reported that the introduction of Zeromist in a chromium bath causes " yellows " in the hollows, or deficiencies on certain parts, or again that its introduction required modifications in the working conditions, *i.e.* chromic-acid concentration, temperature or current density in baths working for years without trouble, was considerable.

The author's company therefore undertook a systematic study of chromium plating in a Hull cell on brass plates previously nickel plated in a Udylite bright nickel bath. The length of the chromium plated zone enabled comparisons to be made between the throwing powers of the baths.

Also carried out were systematic tests in a Hull cell upon polished brass cathodes bent at their middle to an angle of 78 deg., in such a way that the field of distribution of the lines of current was as shown in Fig. 1.

Finally the same series of tests were carried out in tanks on panels 5 cm. square bent at 90 deg. and equidistant from the two anodes.

This last test is a standard one and has been used for a very long time.

Three types of baths were used :

300 gm. per l. of chromic acid and 3 gm. per l. of sulphuric acid,

250 gm. per l. of chromic acid and 3.5 gm. per l. of sulphuric acid,

400 gm. per l. of chromic acid and 4 gm. per l. of sulphuric acid,

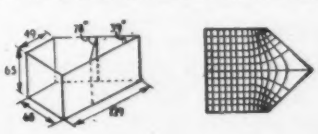
and, in all three cases, the baths were aged by working them on steel cathodes.

It was possible to draw the conclusion from this systematic study that, generally, speaking, the introduction of Zeromist in the chromium bath slightly improves its throwing power instead of reducing it. The best proof of this is the reduction in the burnt zones. But it was also possible to verify that the introduction of Zeromist does not give rise to a high formation of trivalent chromium, and that the best throwing bath is that with 250 gm. per l. of chromic acid. Lastly it was discovered that there are certain anomalies in the measurement of the surface tensions of chromium plating solutions.

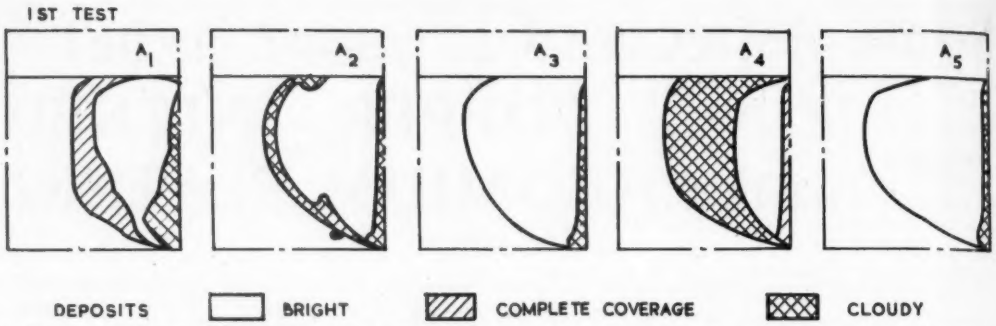
II. THE USE OF SULPHAMIC ACID

The manufacture of sulphamic acid in France began a short time ago. It is used in the paper

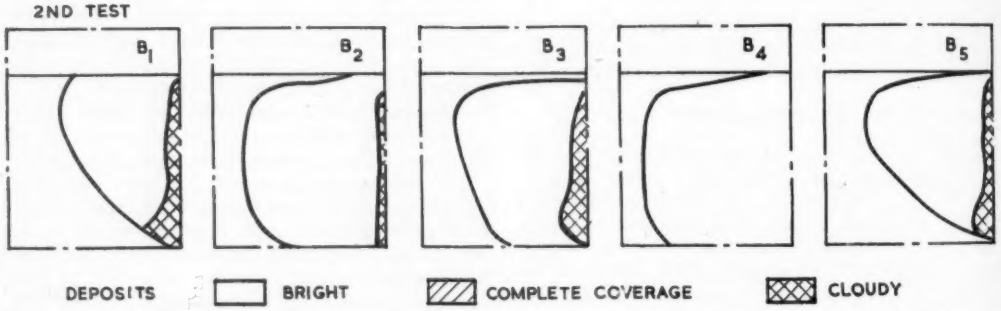
Fig. 1. Diagram of the field formed in a Hull cell between the anode and the cathode bent to 78 deg.



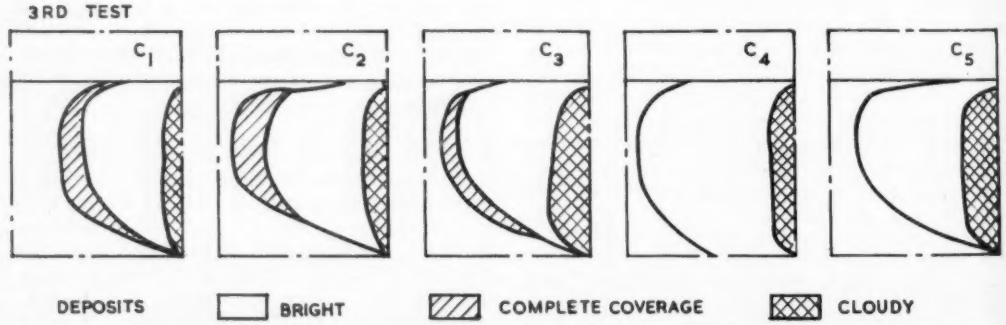
*(Société Continentale Parker)



First test. Bath prepared with 300 gm per l. Cr_2O_3 and 3 gm per l. 68° Bé H_2SO_4. Volume of bath, 270 cu. cm. Time : 3 min. Current : 4 amp. d.c. Temp. : 35°C.



Second test. Bath prepared with 250 gm per l. Cr_2O_3 and 2.5 gm per l. 66° Bé H_2SO_4. Volume of bath, 270 cu. cm. Time : 3 min. Current : 4 amp. d.c. Temp. : 35°C.



Third test. Bath prepared with 400 gm per l. Cr_2O_3 and 4 gm per l. 66° Bé H_2SO_4. Volume of bath, 270 cu. cm. Time : 3 min. Current : 4 amp. d.c. Temp : 35°C.

Fig. 2.—Results of tests carried out in a Hull cell with brass cathode bent to angle of 78 deg.

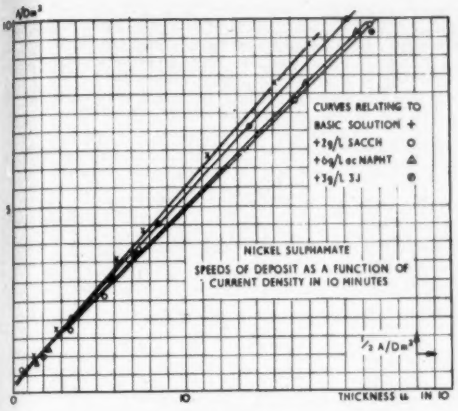


Fig. 3. Nickel sulphamate. Speed of deposition as a function of current density over a period of 10 min.

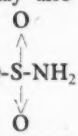
industry for glazing, fireproofing, weed killing, in certain sulphonations, for some acid pickling processes and also in electroplating.

Some industries use sulphamic acid in baths, for various applications, *i.e.* thick nickel deposits, electroforming, and repairs on certain machine tools.

In agreement with the company which manufactures them, nickel, cadmium and copper baths using sulphamates were studied.

The formula for sulphamic acid is the following :

NH_2-SO_3H which may also be written :



To prepare the nickel bath, two molecules of sulphamic acid to one molecule of nickel carbonate were used, in accordance with the reaction :

$$2(HN_2 - SO_3H) + NiCO_3 \rightarrow (SO_3 - NH_2)_2Ni + CO_2 + H_2O$$

The formula for the nickel bath used is the following :

Nickel sulphamate	300 gm. per l.
Nickel chloride	30 gm. per l.
Boric acid	30 gm. per l.
Electrometric *p*H	2½
Temperature	40 to 50°
Current Density	from 1 to 4 amp. per sq. dm.

Low-pressure compressed-air agitation.

The sole object of this bath was to obtain thick, hard, but bright deposits, but as constituted gave a cloudy, hard, but fragile deposit. An attempt was therefore made to use different organic agents enabling both the brightness and ductility to be increased.

The Udylite Brightener No. 3 at a concentration of 5 gm. per l. produced bright, hard and ductile deposits. At 3 amp. per sq. dm., the speed of deposition was of the order of 0.6 micron per minute, the cathode efficiency being 94 per cent. at the same current density.

In another series of tests, in accordance with M.B. Diggin's study, 10 gm. per l. of naphthalene trisulphonic acid 1-3-6 was used. The deposits obtained were hard and ductile but they were only bright in the low-current-density areas. The speed of the deposition and the cathodic efficiency are of the same order as in the previous case.

The Efco-Udylite Brightener No. 3 J enabled neither the ductility nor the brightness to be increased.

It may therefore be concluded that the best results were obtained with the Udylite brightener No. 3 while remarking, however, that at heavy current densities the use of this brightener gives rise to a region of pitting which requires the use of a super-active agent, unlike 1-3-6 naphthalene trisulphonic acid, which produces much less.

The addition of Brightener No. 1 RL to this bath gives disastrous results. The deposit although extremely bright has such strong internal stresses that it cracks all over immediately.

Sulphamic acid has also been used in the constitution of a copper bath, and of a cadmium bath.

In so far as the copper is concerned, from one to two molecules per litre of copper sulphamate and 50 to 60 gm. per l. of free sulphamic acid were used. This investigation showed that from the point of view of appearance of the deposit the best current-density region is between 4 and 6 amp. per sq. dm. At this current density the cathodic efficiency is of the order of 92 per cent., and the introduction of a brightener, either of the thiourea group or others, gave no result.

In so far as the cadmium bath is concerned, it consisted of :

1 molecule per l. of cadmium sulphamate
8 gm. per l. of free sulphamic acid
100 gm. per l. of ammonium sulphamate.

The different tests were carried out at current densities of from 1 to 4 amp. per sq. dm., at ambient air temperature. At 2 amp. per sq. dm. the speed of deposition is about 0.7 micron per minute and the cathodic efficiency is of the order of 88 per cent. The covering power was determined by the same cell method as for the chromium baths. Throwing power covers half of the surface of the cell.

Various tests or organic or mineral brighteners gave no result, and it may therefore be deduced from this study that the use of sulphamic acid for

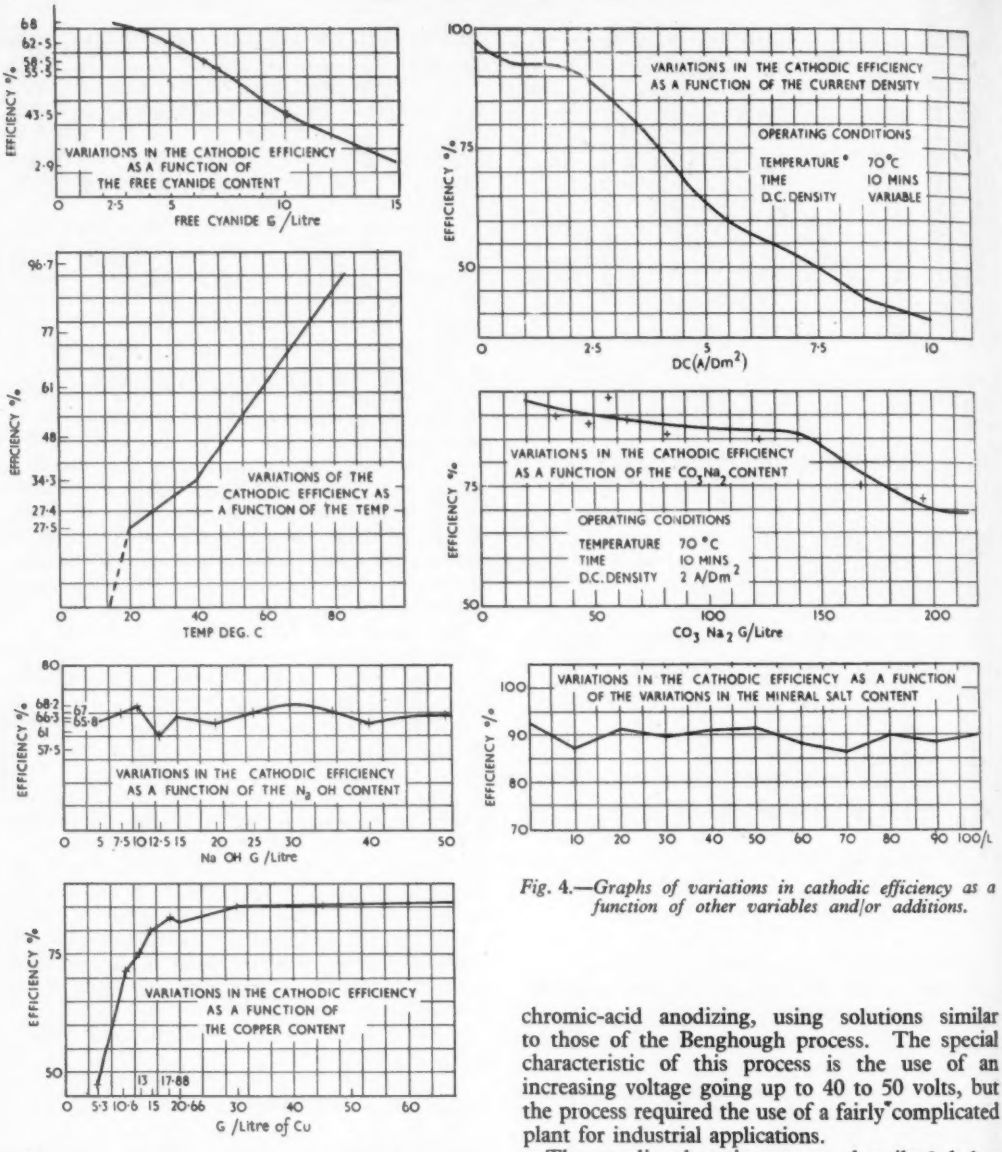

EFFICIENCY %
VARIATIONS IN THE CATHODIC EFFICIENCY AS A FUNCTION OF THE FREE CYANIDE CONTENT
FREE CYANIDE G/Litre
VARIATIONS IN THE CATHODIC EFFICIENCY AS A FUNCTION OF THE CURRENT DENSITY
OPERATING CONDITIONS
TEMPERATURE ° 70°C
TIME 10 MINS
D.C. DENSITY VARIABLE
DC(A/Dm²)
VARIATIONS OF THE CATHODIC EFFICIENCY AS A FUNCTION OF THE TEMP
TEMP DEG. C
VARIATIONS IN THE CATHODIC EFFICIENCY AS A FUNCTION OF THE CO3Na2 CONTENT
OPERATING CONDITIONS
TEMPERATURE 70 °C
TIME 10 MINS
D.C. DENSITY 2 A/Dm²
CO3 Na2 G/Litre
VARIATIONS IN THE CATHODIC EFFICIENCY AS A FUNCTION OF THE N2 OH CONTENT
Na OH G/Litre
VARIATIONS IN THE CATHODIC EFFICIENCY AS A FUNCTION OF THE VARIATIONS IN THE MINERAL SALT CONTENT
VARIATIONS IN THE CATHODIC EFFICIENCY AS A FUNCTION OF THE COPPER CONTENT
G/Litre of Cu

Fig. 4.—Graphs of variations in cathodic efficiency as a function of other variables and/or additions.

cadmium baths is only of purely scientific interest. The appearance of the deposit is coarse and impossible to brighten without almost completely dissolving it with known chemical polishing solutions.

III. LIGHT ALLOYS

In the field of light alloys, investigations of chemical treatments with a view to the use of Udylite in the aeronautical industry or for bright nickel plating, were followed by a new study on chromic-acid anodizing, using solutions similar to those of the Benghough process. The special characteristic of this process is the use of an increasing voltage going up to 40 to 50 volts, but the process required the use of a fairly complicated plant for industrial applications.

The anodic chromic process described below was perfected in France. Its original feature is the necessity for a constant ratio between the hexavalent chromium ions and the trivalent chromium ions which are produced automatically by the introduction of a powerful reducing agent. The quantities of this reducing agent, which may be oxalic acid, lactic acid or tartaric acid were such that immediately on setting the bath to work the desired ratio : $\frac{Cr^{6+}}{Cr^{6+}}$ is obtained.

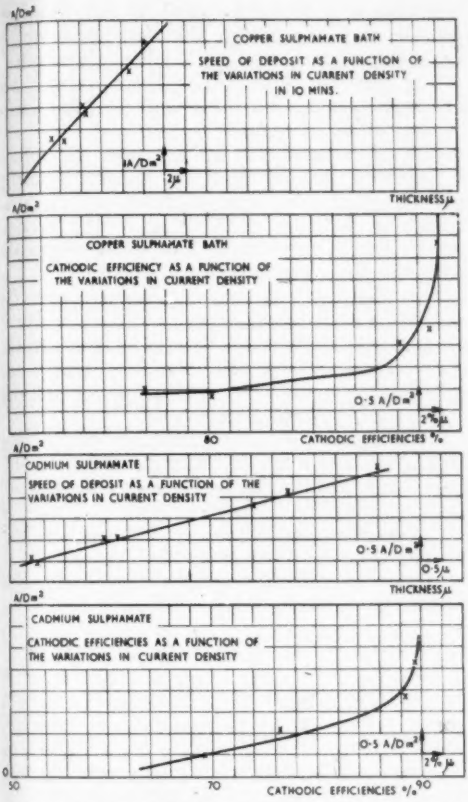


Fig. 5.—Copper sulphamate bath. Speed of deposition as a function of the variations in current density over a period of 10 min.

The ratio considered to be most suitable is that obtained when, in solution, there are about 10 molecules per gm. of chromic acid to one molecule per gm. of Cr_2O_3. The layer obtained is opaque.

Micrographic examination did not show that this opacity is due to the presence of chromium in the film, but rather to the orientation of the alumina crystals. It was possible, moreover, to obtain a transparent film at certain conditions of temperature, but, it thus lost its special property, *i.e.* its resistance to alkaline media.

The opaque film obtained is, in fact, more resistant to the action of alkalis than the layer obtained by using a sulphuric-acid bath. For a film obtained in 40 minutes, for example, a drop of sodium-zincate solution pierces the transparent film obtained from a sulphuric bath in 1½ minutes. It pierces the opaque film obtained from the chromic bath cited in 35 minutes.

The opaque film obtained is slightly less hard than a film obtained from a sulphuric bath and its hardness seems to decrease with temperature. Its breakdown voltage also decreases with temperature, but it rapidly reaches 500 volts, when it remains static. It is therefore practically impossible to have a breakdown voltage from this bath greater than 500 volts.

All the preceding operations, *i.e.* anodizing, sealing and all the colouring are the same as for classic anodic oxidation.

In the case of this process, a noticeable difference is the use of a temperature of the order of 45°C. when it is known that in the case of sulphuric oxidation the bath should be kept at a temperature of the order of 20°C.

The French aeronautical industry now often specify anodic-chromic anodizing.

IV. ZINC PLATING OF CAST IRON

A great variety of operations are necessary for the preparation of the surface of cast iron especially when it is necessary to produce on these alloys a deposit from solutions with low hydrogen overvoltage, as is the case for the zinc bath. It is in fact necessary to eliminate oils, greases or polishing compounds which remain on the metal. Again, it is necessary to eliminate oxide films as well as inclusions of graphite and sand from the foundry.

Several methods of treatment have been published by various authors, including the A.S.T.M. ; all these have been tried and have not given the expected results.

The process which the author has perfected for the zinc plating of cast iron and which can be used in an automatic line, is briefly described here. This process is valid for any type of cast iron, *i.e.* white cast iron, grey, nodular or spheroidal cast iron and malleable cast iron.

Alkaline pre-cleaning, or emulsions, gave very bad results because of the retention of alkaline or other products in the pores of the metal. Degreasing was therefore effected with chlorinated solvents. This operation is immediately followed by alkaline degreasing. Degreasing is done anodically, in order to avoid hydrogen embrittlement. The current density should be higher than 7 amp. per sq. dm. ; the temperature should be higher than 90° C. and the maximum time from 2 to 3 minutes.

The same defects were noticed as when carrying out alkaline pre-degreasing when degreasing was carried out over too long a time. This operation is followed by hot rinsing at a temperature of the order of 75°C., then cold, by dipping or preferably with a spray. This abrupt variation in temperature seems to suit high carbon content steels perfectly.

It seems that this abrupt variation favours the elimination of matter retained in the pores and which might not have been eliminated after the two degreasing operations.

The next operation is one of chemical pickling. It is certain that the pickling operation is the most critical in all ranges of the preparation of cast iron. The greatest difficulties are apparently due to free graphitic carbon which appears in the form of nodules or flakes and which is precipitated on to the surface of the parts. Hydrochloric pickling baths were tried at concentrations varying between 2 and 100 per cent, in addition to sulphuric pickling baths at several concentrations, and phosphoric and phosphoric-sulphuric pickling baths, etc.

It was found from these different tests that the process cannot be guaranteed whatever may be the acid used or its concentration.

Anodic etching in a sulphuric medium did not give the expected results either, whether carried out in a diluted or concentrated sulphuric-acid bath. The only bath capable of giving correct results is the sulphuric-hydrofluoric bath in which the respective concentrations of sulphuric acid and hydrofluoric acid are critical. With this bath it was possible to treat, both in the author's works and those of customers, a very large quantity of parts. This operation is followed by cold rinsing and activation in a solution of 25 gm. per l. sodium cyanide without current.

After cold rinsing, a cadmium flash was carried out at 2 amp. per sq. dm. lasting 2 to 3 minutes, followed by cold rinsing and zinc plating.

This method of preparation avoids not only stoving at 200° for several hours both before electrolytic treatment and after, but also the operations requiring a special installation such as that for the anodic method, the sulphuric treatment or electrolytic polishing for example. A Junior automatic installation with extension, will permit zinc plating of cast iron using this technique.

V. ALKALINE COPPER PLATING BATHS

The scarcity of nickel on the one hand and the bad quality of cast or die-cast white alloys on the other led to a large series of investigations on alkaline copper plating baths, with a view to obtaining thick deposits capable of being easily brightened or deposits bright in themselves.

The first part of the investigation was to find the best basic formula for the copper plating bath, and the results were presented in a paper. The curves representing the variations in the cathodic efficiencies in relation to the different factors constituting the bath and conditions of use are sufficient to give information upon the composition to choose. This part of the study also made it possible to perfect a simple method of measuring the cathodic efficiencies which were also described in the paper.

In the second part of the investigation an attempt was made to obtain a bright deposit starting from a given basic formula. This was not a question of obtaining a very bright deposit, but only one capable of giving a high thickness so as not to upset the brightness of the Udylite nickel bath.

The physical tests which were carried out included periodic inversion and periodic interruption of the current.

It is to be noted that in both cases the deposit is improved without, however, making it bright, and the great advantage of these two processes consist in a better distribution of the deposit, which is extremely useful when it is a question of nickel plating complicated die-castings.

The chemical tests carried out were connected with looking for one or more processes capable of giving a sufficiently bright deposit without periodic interruption. A large number of both mineral and organic compounds were tried and it was possible to formulate several general rules.

Practically all sulphur, mineral or organic compounds allow deposits ranging from a semi-bright satin finish to full brightness to be obtained. Their disadvantage, however, is to give rise, in the medium-current-density range to clouding in the characteristic form of an S, if it may be so described, of the sulphur products, which it is difficult to eliminate ; again, these products, in the high-current-density range, give rise to a region of pitting which can only be got rid of by means of a surface-active agent, the choice of which was extremely difficult on the one hand because it is necessary for it to be cation-active or non-ionic, soluble and stable in an alkaline medium, and on the other hand because it must be compatible with the surface-active agent of the Udylite nickel bath.

All the organic compounds capable of promoting cathodic polarization also allow semi-bright deposits to be obtained.

It is apparent that the phenomenon of polarization is periodic and that as a consequence the speed of deposition as well as the cathode efficiency are decreased as a result.

A certain number of rare metals used, either alone, or simultaneously with other organic or mineral compounds are capable of giving deposits of greater interest, in the sense that they give bright deposits at all current densities, both when using direct current and with periodic reverses or interrupted current.

Patents have been taken out in France in connexion with alkaline bright copper plating baths ; it is thus hoped rapidly to develop bright nickel plating of parts cast in zinc-base alloys.

VI. IMPURITIES IN THE UDYLITE BRIGHT NICKEL BATH. THEIR INFLUENCE AND THEIR ELIMINATION

A bright nickel bath may acquire impurities of two types while it is working, *i.e.* metallic impurities, and organic impurities. It is known that impurities

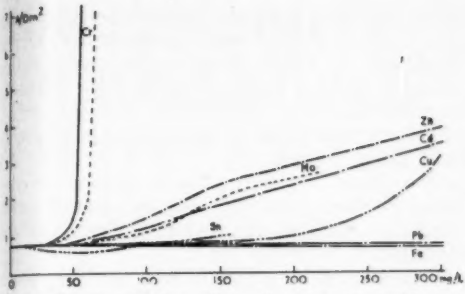


Fig. 6.—Graphs showing effect of various impurities on "covering" power of bath.

present in a bath act principally in regions of low current density. This is especially true for metallic impurities, and often for the organic impurities which make their appearance in accordance with a little understood physico-chemical process which probably results from the structure of the ions which come from large molecules, from their polarity, from their free energy, etc.

Deposits of nickel obtained at low current densities will be poor and have a harmful effect on the covering power of the chromium plating bath, that is to say, on the minimum current density at which the chromium deposit commences to form.

It seemed interesting therefore to determine qualitatively and quantitatively what was the influenec of metallic impurities on the Udylite nickel bath. A paper giving the results was read before the last French conference on hard chromium.

For all the tests the bath used was the Udylite 31 H nickel bath.

The different methods which were used after wards for the elimination of the artificially added impurity were :

1. Sequestration by the tetrasodium salt of ethylene diaminetetracetic acid (E.D.T.A.).
2. Reduction by sodium hydrosulphite, or reduction by hydrosulphite and sequestration or reduction and precipitation.
3. Displacement or electrolysis at low current density.

I. Copper

This was added in the form of $CuSO_4.5H_2O$. When the concentration of copper is increased to 300 mmg. per l. it is seen that at low current densities a milky film appears, then black traces which extend and form a black zone up to 0.8 amp. per sq. dm.

At intermediate current densities the deposit becomes streaky and loses its clearness, while at the high current densities it becomes semi-bright and is covered with pits.

The maximum permissible concentration is about 100 mmg. per l. The covering power of the chromium plating bath increases slowly up to 150 mmg. per l., then afterwards much more quickly. Sequestration by E.D.T.A. gives a very noticeable improvement.

Reduction in the amount of E.D.T.A. again brings about an improvement in the appearance, but these treatments are not sufficient to eliminate the impurity completely.

II. Zinc

This was introduced in the form of $ZnSO_4.7H_2O$. When its concentration increases to 300 mmg. per l. black stains appear on the low-current-density area and rapidly extend.

At intermediate current densities the nickel deposit becomes semi-bright, then rough and uneven, while at the high current densities larger pits occur. The maximum permissible concentration is 75 mmg. per l. and the covering power of the chrome bath increases rapidly after 75 mmg. per l.

Sequestation by E.D.T.A. does not bring about any change. Reduction by hydrosulphite in the presence of a sequestering agent only brings about a very slight improvement ; the levelling is improved and the pores eliminated. Selective electrolysis alone enables this impurity to be eliminated.

III. Iron.

This was introduced in the form of $FeSO_4$ slightly acidified by sulphuric acid, but by oxidation at the anode, it passes to the ferric form and is precipitated in part at *p*H 3.5 ; the *p*H was therefore adjusted to 3.5 after each addition.

The solution becomes troublesome from 100 mmg. per l. ; the effect becomes more intense with additions which give precipitates of ferric hydroxides.

No change in the nickel deposit is observed up to 300 mmg. per l. and the covering power of the chromium is not affected either. Since the iron eliminates itself automatically by oxidation and precipitation, there is no reason to look for another method of elimination.

IV. Chromium

This was introduced in the form of a dilute solution of chromic acid. As the chromium concentration increases from 0 to 70 mmg. per l. the nickel deposit at low current densities becomes very thin and then disappears. At intermediate current densities the deposit becomes cloudy and then milky with streaks and numerous pits. Finally, at high current densities, it ends by turning black and powdery.

This disappearance of the nickel deposit is already very marked at 30 mmg. per l. The covering power of the chromium bath increases sharply at the same value. Sequestration by E.D.T.A. for 70 mmg. per l. of chromium brings about a certain improvement. Reduction by sodium hydrosulphite at a *p*H of the order of 5 does, on the other hand, enable the chromium to be completely eliminated by precipitation in the form of hydroxide.

The properties of the nickel deposit as well as the covering power of the chromium are thus re-established.

V. Lead

This was introduced in the form of a solution of $PbCl_2$. In raising the concentration to 800 mmg. per l. it is found that the deposit clouds at low current densities and takes on a reddish brown coloration. At intermediate current densities pores appear which lead to large stains and engraved streaks form at high current densities. The maximum permissible concentration is of the order of 150 mmg. per l. There is practically no change in the covering power of the chromium.

Sequestration by E.D.T.A. only brings about a very slight improvement. Hydrosulphite gives more marked improvement because part of the lead precipitates in the form of sulphate. Selective electrolysis permits elimination of the lead, which deposits at the same time as the lead peroxide on the anodes.

VI. Tin

This was introduced in the form of $SnCl_2$. H_2O acidified with hydrochloric acid. Towards 50 mmg. per l. a slight improvement at high current densities may be found, which then disappears. A cloudy and pitted deposit is obtained. The maximum concentration is 50 mmg. per l. and even at a *p*H of 3.5 the beginnings of precipitation are perceived. At a content of 50 mmg. per l. the covering power of the chromium bath is slightly improved.

A small quantity of tin therefore seems to have a favourable effect in the nickel on the one hand, and upon the covering power of the chromium bath, on the other.

Since the tin appears to eliminate itself completely by hydrolysis and precipitation even at low concentration, it was unnecessary to find a means of eliminating the impurity.

VII. Cadmium

This was introduced in the form of a solution of $CdCl_2$. When the concentration is increased up to 700 mmg. per l. a dark zone accompanied by pits which develop and form deeply 'engraved' streaks is found to occur at high current densities. At intermediate current densities the deposit, at first milky and then uneven, finishes by being covered by the streaks of the low current densities while at the high current densities pits becoming more and more numerous extend over the surface and take up the form of little " comets," the axis of these being vertical.

It is found that the maximum permissible concentration both from the point of view of nickel deposition and for the covering power of the chromium is 70 mmg. per l.

Sequestration by E.D.T.A. does not bring about any change. Sodium hydrosulphite brings about a fairly marked improvement by causing the pits to disappear and by improving levelling. Selective electrolysis remains the only efficient means of eliminating this impurity.

VIII. Molybdenum

This was introduced in the form of $Na_2.MoO_4.2H_2O$. Its increase up to 200 mmg. per l. causes the appearance of a milky zone at low current densities. From 100 mmg. per l. the deposit is suppressed in the low-current-density areas. The maximum permissible concentration as regards nickel plating, as for the covering power of the chromium, is round about 75 mmg. per l.

Sequestration by E.D.T.A. has no effect; hydrosulphite on the contrary shows itself to be most efficacious, since trivalent molybdenum is less harmful than hexavalent molybdenum.

((*Continued in page* 496)

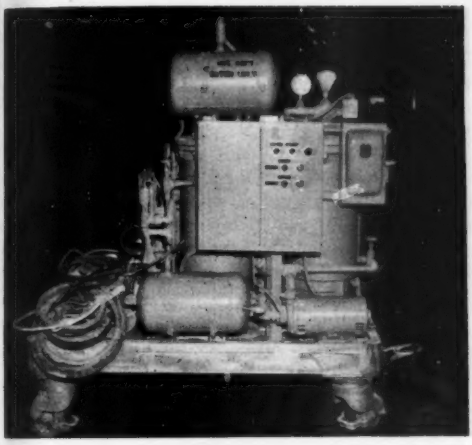
TABLE I.

Impurity	Maximum Permissible Concentrations. (in mmg. per l.)		Elimination.
	Appearance of the nickel maximum.	Appearance and covering power of the chromium bath.	
1. Copper	100	100	Displacement—Electrolysis.
2. Zinc	75	75	Electrolysis.
3. Iron			Precipitates automatically.
4. Chromium	30	30	Reduction by $Na_2S_2O_4$.
5. Lead	150	150	Reduction by $Na_2S_2O_4$.
6. Tin	50	50	Precipitates automatically.
7. Cadmium	75	75	Electrolysis.
8. Molybdenum	75	75	Reduction by $Na_2S_2O_4$.

AIRLESS SPRAY EQUIPMENT FOR MAINTENANCE USE

Design Reduces Clogging With Low-Solvent Paints

Described by R. B. PAYNE*



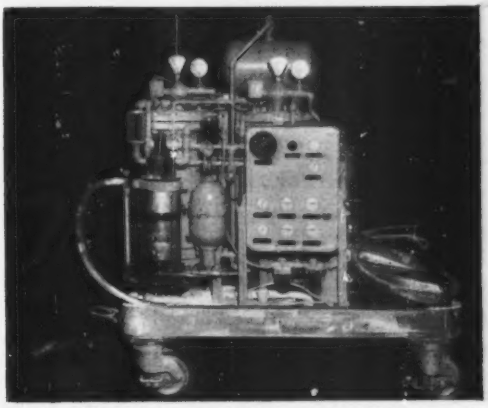


Fig. 1.—left. Side view of the new type airless spray rig showing electrical components box with external switches for high and low temperatures start-stop push buttons and pilot lights which indicate when the heaters are on.

Fig. 2.—above. View of the other side of the airless spray rig which is mounted on a welded aluminium dolly.

A new-type airless spray rig, specially developed for use by maintenance personnel in Douglas Aircraft Company's El Segundo plant, permits the safe usage of spray guns in many areas where such high-speed finishing equipment was not previously practical.

Compared with older airless units, it has the advantages of being non-susceptible to clogging, even when coatings with relatively low quantities of solvent are employed, of maintaining correct nozzle temperatures where materials must be applied *via* 150-ft. lengths of hose, of being highly resistant to wear when abrasive-filled solutions are sprayed, and of saving much of the setup time normally required to prepare for finishing operations. These factors are largely attributable to the fact that the design of the new equipment eliminates the need for the recirculation of finishing dispersions.

In essence, the operation of the equipment involves the high-pressure pumping of a finishing solution through a pair of heat exchangers (which elevate coating temperatures by means of hot water) to an extruded neoprene hose with three channels, two of which are used to maintain elevated coating temperatures by recirculating hot water around a central channel which feeds paint to a spray gun.

Virtually all types of organic finishes can be applied with the new unit, but it is at present being used for applying flat mill-white paints. The latter are alkyd or oil-base fluids containing substantial quantities of No. 5 abrasive pigment. Such coatings have viscosities ranging from 80 to 100 Kreb units at room temperature and 55 to 65 Kreb units at 160°F. (the temperature at which they are ordinarily applied with the airless equipment.)

In some relatively inaccessible plant areas, maintenance personnel are able to finish surfaces 10 ft. away from the nozzles of the spray guns. However, due to the fast-drying characteristics of the mill-white dispersions, operators are expected to work closer to the deposition surfaces whenever possible.

Fast-drying coatings are used in order to protect expensive equipment in areas where maintenance finishing is necessary, for if they are suspended in air for any appreciable interval, the coating particles

*Mechanical Design Engineer, Plant Engineering
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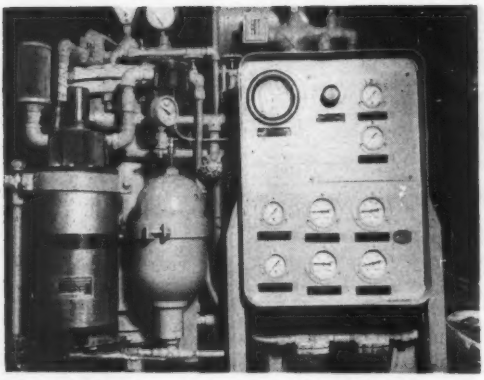


Fig. 3—A close-up view of the instruments and controls used in operating the airless spray rig.

ejected by the airless guns have no more " tack " than dust when they come in contact with a solid surface.

Overspray is not usually a serious problem in using any type of airless equipment, but it can be considerable where articles like beams and trusses are finished with wide nozzle fans. Therefore, the fast-drying characteristics which enable particles of the mill-white paints to lose tack in mid-air simplify the task of cleaning up areas where overspray falls.

Exhaustive tests, made over a period of almost two years, have shown that the airless spray rig does not require the construction normally used to " explosion proof " hot-spray finishing equipment. In addition, it has been repeatedly demonstrated that the mill-white output of the guns cannot be readily ignited with a blowtorch. However, due to the sometimes unpredictable characteristics of sprays, maintenance personnel are instructed to avoid situations that might be conducive to fires in the same way as if they were using standard pneumatic equipment.

The airless equipment does not require the maintenance that would be essential if abrasive-laden coatings were sprayed with comparable commercial equipment, primarily because use is made of a paint pump with a piston which displaces into a cavity instead of rubbing against cylinder walls. This pump is a single-acting, air-driven unit with Teflon packing which is immersed in the mill-white coating solvent at all times in order to prevent the hardening of paint therein.

Operated with 90-lb. per sq. in. compressed air, the paint pump can provide one gallon of mill-white per minute at 0 to 1,000 lb. per sq. in. for the heat exchangers with approximately a 13 to 1 ratio between its air and paint pistons. Nozzle demands occurring when the pump is on its return stroke are taken care of by a pressure accumulator, precharged to 350 lb. per sq. in.

For most finishing operations now being performed, the pump's output pressure is 700 lb. per sq. in. and coating materials are delivered to heat exchangers in accordance with their needs (since as many as four spray guns may be simultaneously operated with the two exchangers). Because it is constantly loaded, the pump is automatically started and stopped as spray operations begin and end.

Each of the heat exchangers receiving paint from the latter pump is a coaxial copper-coil and shell unit which retains water in the shell and inner coil for the purpose of heating paint under pressure

Fig. 4—above. The new airless spray rig enables workers to finish surfaces which would be inaccessible to other equipment at distances up to 10 ft. from the spray gun nozzle.

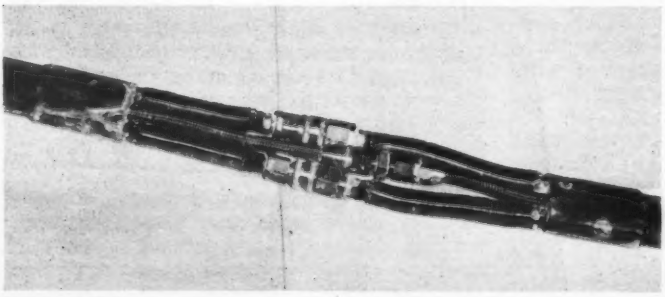


Fig. 5.—left. The use of rapid unions to join 30 ft. lengths of hose makes spraying possible at relatively great distances from the spraying rig.

in an annular coil area. Their elevated water temperatures are maintained by a pair of 7½-kilowatt immersion heaters which derive power from the 60-cycle, 440-volt, 3-phase alternating current circuit which is available in the plant.

Water temperatures in the heat exchangers are determined by paint demand, and the design of the thermostatic controls is such that they cannot exceed 190°F.

Where paint hoses must be 150 ft. long, each heat exchanger can provide paint for one spray gun with a nozzle output of 3/10 gallon per minute.

Distilled water is used to charge the heat exchangers in the new airless spray rig, since the mineral content of tap water in the El Segundo area would soon cause a build up of damaging mineral deposits in the hot-water system. However, since a given quantity of distilled water can be used indefinitely in the closed system, this is not an important cost factor.

Prior to the beginning of a day's work, preheating must usually take place for about 20 minutes before the unit with 150 ft.-long hoses is warm enough to maintain satisfactory coating temperatures. Much shorter preheating intervals are allowable if hoses have less length and atmospheric temperatures are relatively high.

In any event, heated water is circulated or recirculated through paint hoses at the rate of ¾ gallon per minute.

Neoprene extrusions, 30 ft. long, are used as finishing lines, and the central channel in each extrusion contains a 30 ft.-long high-pressure Teflon hose (the purpose of which is to keep finishing materials from coming in contact with neoprene surfaces and to contain high operating pressures). Quick disconnects at the ends of the neoprene water channels, and unions at the ends of the Teflon hose segments, facilitate use of as many 30-ft. sections as necessary.

The airless spray guns are standard pneumatic-type units, modified to permit use of only one paint hose connexion on the handle by means of a high-pressure casting. Each is equipped with an abrasion-resistant ceramic nozzle, which may be used for 150 to 250 hours where mill-white maintenance finishes are applied and nozzle coating pressures average about 600 lb. per sq. in.

Instruments and controls used in operating the new airless spray rig include :

(1) Two gauges for the indication of temperatures of water entering and leaving each heat exchanger.

(2) Two gauges for the indication of water pressures leaving the heat exchangers.

(3) An input air-pressure gauge for the paint pump.

(4) An output coating pressure gauge for the paint pump.

(5) A manually-adjusted knob for the precision regulation of finishing pressures.

(6) Two gauges indicating the output pressures of coatings leaving the heat exchangers.

(7) Two gauges indicating temperatures of coatings leaving the heat exchangers.

(8) A thermostat for the control of output coating temperatures for each heat exchanger. (This device is internally set, but might advantageously be equipped with an external adjustment for some applications).

(9) A disconnect switch for electrical service.

(10) An electrical components box with external switches for high and low heater temperatures and " start-stop " buttons ; also pilot lights which glow when heaters are on.

The rig also has a 5-gallon surge tank for the purpose of equalizing the input supply of plant air where long pneumatic lines must be used, and a 5-gallon expansion tank which makes allowances for volume increases in water when the latter is heated. The expansion tank maintains the water-pump suction at atmospheric pressure, by venting the expansion tank to atmosphere.

Ample provisions have been made for maintaining the equipment. For example, all heat-exchanger connexions have been situated so that an entire coil can be extracted by removing the top flange of either exchanger.

Because it should have optimal portability in order to meet the maintenance finishing requirements, the equipment is mounted on a dolly which has a 60-in. x 35-in horizontal surface area. Supporting the welded aluminium dolly structure are four rubber-tyred castors, two of which swivel for the sake of manoeuvrability.

Storage space for all extruded neoprene lines that are needed in feeding coating materials to spray guns is provided on the front end of the dolly.

Mixed paint for finishing operations is pumped from an open barrel by means of a suction line connected directly to the paint pump suction connexion ; and for this reason, the paint pump is at ambient room temperature at all times.

When water is properly heated and in circulation, the rig is made ready for use by priming the paint pump (with about six strokes) and pressurizing the finishing hoses. This is usually accomplished in less than 20 seconds. Pressurized coating materials are then released by depressing a spray-gun trigger. Many different sizes of nozzles can be used on the spray guns when it is desirable to atomize varying quantities of coating materials or to employ more than one spray pattern.

Virtually no backspray is produced, even when the nozzle of a spray gun is only an inch or two away from a deposition surface, because the atomized coating particles are not borne on expanding

(*Continued in page* 496)

THE INSTITUTE OF METAL FINISHING
AUTUMN MEETING AND LUNCHEON

Report of Annual General Meeting and Presidential Address

THE Autumn meeting of the Institute of Metal Finishing was held at the Charing Cross Hotel, London, on November 18 and was preceded by a luncheon at which the principal guest and speaker was the Rt. Hon. Herbert Morrison, C.H., M.P. in his capacity as President of the Parliamentary and Scientific Committee. The luncheon was attended by some 80 members of the Institute and their guests, and the retiring President, Mr. R. A. F. Hammond, presided and replied on behalf of the Institute to the toast proposed by Mr. Morrison. In the course of his reply the President proposed the health of the newly elected President, Dr. T. P. Hoar, whose formal induction was to be staged at the afternoon meeting.

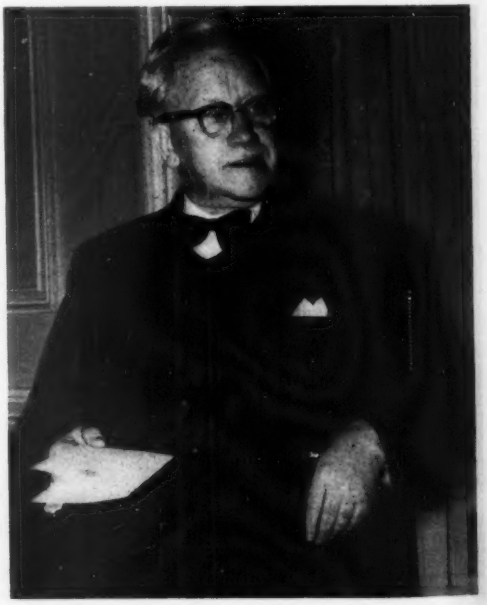
Following the luncheon the Annual General Meeting of the Institute was held. In the absence of the Treasurer, Mr. F. L. James, owing to illness, the statement of accounts was presented by the Chairman of the Finance Committee, Dr. L. B. Hunt. The accounts showed a substantial increase, both in income and expenditure and the increased activities and rising administrative costs of the Institute had resulted in a significant deficit on the year. The steps being taken by Council to counter the financial losses which had characterized the accounts for the past three years were outlined in their Annual Report. The accounts were adopted on a proposition from Mr. John Hooper, with which he coupled a vote of thanks to the Hon. Treasurer for his valued work in the interests of the Institute.

The Annual Report of the Council for the previous session was, in the absence abroad of the Hon. Secretary, Dr. S. Wernick, presented by Mr. R. A. F. Hammond. This showed that the past year had been an extremely active one with an increase in the number of meetings held, the inauguration of a new local branch, and a record attendance at the Annual Conference. Moreover, for the first time in the last three years there had been a small nett increase in the total number of members. The session had been marked by a layout competition organized by the Midland branch, which had evoked a considerable amount of interest and publicity.

The Annual Conference at Brighton, which had attracted an overall attendance of 423, includir g delegates from eight other countries, had marked up a new record in this respect. The sixteen papers which were presented during the course of the Conference, had all been keenly discussed and the Institute had been privileged in having Dr. U. R. Evans to deliver the fourth Hothersall Memorial Lecture at an evening meeting during the Conference.

By far the greater part of the financial expenditure of the Institute went on publishing activities, and it had become apparent that in view of the greatly increased costs associated with printing and publishing some economies would have to be effected in this direction. The Publications Committee had therefore recommended to Council that the publication of papers in the Quarterly Bulletin and subsequently again in the Transactions was an unjustifiable duplication and the decision had therefore been taken to replace both these publi-

The Rt. Hon. Herbert Morrison, principal guest at the luncheon, proposing the toast of the Institute of Metal Finishing.



The full report, which has previously been made available to members present at the meeting, was adopted on a proposition by Mr. John Sprague with which was associated a vote of thanks to the Hon. Secretary, Dr. S. Wernick.

The Chairman then announced the results of the ballot for the election of officers and Council for the ensuing session, as follows :

President : T. P. Hoar ; *Immediate Past President :* R. A. F. Hammond ; *Vice-Presidents :* G. L. J. Bailey, J. E. Garside, A. A. B. Harvey, L. B. Hunt, H. Silman, A. Smart, A. W. Wallbank, I. T. Watkins ; *Honorary Treasurer :* F. L. James ; *Honorary Secretary :* S. Wernick ; *Council :* J. Dawson, J. Edwards, B. J. Jones, E. E. Longhurst, E. L. Masek, J. M. Sprague, W. Stein, C. Wharrad. Ex Officio members of the Council are the chairmen of local branches and of the Organic Finishing Group, *viz., London :* G. L. J. Bailey ; *Midland :* D. N. Layton ; *Sheffield and North East :* C. E. Proctor ; *North West :* E. D. Chapman ; *Scottish :* W. Watson ; *South West :* N. R. Laban ; *Organic Finishing :* J. N. T. Adcock.

The Chairman then presented to Mr. F. H. Reid (Mond Nickel Co. Ltd.) the Johnson Matthey Silver Medal and the Westinghouse Brake and Signal Co. Ltd. prize, both of which had been awarded for his paper entitled " Some Experimental and Practical Aspects of Heavy Rhodium Plating."

Then followed the formal induction of the new President, Dr. T. P. Hoar, by the outgoing president, Mr. R. A. F. Hammond, who invested him with the Presidential Badge of Office receiving in his turn from the new President, the Past President's Medal.

(above) The new President, Dr. T. P. Hoar, being invested with the Presidential Badge of office by the retiring president, Mr. R. A. F. Hammond.

(right) Mr. R. A. F. Hammond (left) receiving from Dr. T. P. Hoar the past president's medal.

cations by a single bi-monthly journal, which would have the advantages of costing less and ensuring more topical publication of papers.

The year had been marked by the formation of another local Branch of the Institute in the South-West. This had its headquarters at Bristol and was the sixth Branch to be created. Its inception was the occasion of an inaugural luncheon, works visit and technical session all of which received encouraging support from local members and from representatives of other Branches.

The President, Dr. T. P. Hoar, hands to Mr. F. H. Reid the Johnson Matthey Silver Medal and the Westinghouse Brake and Signal Co. Ltd. Prize awarded for his paper entitled "Some Experimental and Practical Aspects of Heavy Rhodium Plating."

PRESIDENTIAL ADDRESS

"The Future of Metal Finishing"

Following his formal induction Dr. Hoar delivered his Presidential Address on "The Future of Metal Finishing."

Dr. Hoar said he had chosen that subject because it was his passionate belief that no field of endeavour of any kind could flourish unless its leaders looked forward rather than back, unless they took past successes literally for granted so that they could devote their thinking to present problems and their solution.

Up to the present time metal finishing practice had in most cases for so long outstripped theory that there was a large back log of fundamental knowledge and understanding to be made up; for so long as a technology remained in such a state its progress, both as to improvements and as to wider uses, would be gravely hapered.

Dr. Hoar went on to refer to a number of aspects of metal finishing in relation to which fundamental questions could not be answered in anything more than the crudest qualitative way, yet upon them depended the future progress and perhaps the survival of the processes and the industries that lived by them.

Although the present state of research in metal finishing science presented a somewhat depressing picture for various reasons outlined by Dr. Hoar, he was confident that the present small volume of research work and research workers was capable of quite rapid expansion; the field of investigation was just as exciting for investigation as were the more widely popular fields in metallurgy and physical chemistry.

Dr. Hoar urged that there was at present no room for complacency about the advance of metal-finishing processes if they were judged by results and in relation to the results achieved in other fields of metallurgical and general technology. He called for far greater co-operation between electroplating supply houses, paint manufacturers and similar organizations on the one hand, and the users of their products and processes on the other, which could lead to a much higher average quality in the metal finish finally produced. He derided the suggestion that complete frankness concerning processes and formulation would lead to the users of these processes compounding them for themselves. This had not proved to be the case in other industrial fields and he was convinced that any manufacturer who plainly stated the formulation of his product, noted the function of each ingredient, explained what difficulties might arise and why and suggested the best way of overcoming common problems, would create enormous goodwill and interest among enlightened metal finishers.

Continuing his Address the President made many thought-provoking comments concerning his view of the role which the Institute could come to play in the metal finishing industry, and he referred to the new publication policy which it was proposed to initiate in the course of the following year.

Dr. Hoar concluded by paying a tribute to the very important contribution made to the progress of metal finishing by the regular meetings held by the branches of the Institute, and he suggested that this could be still further improved if they occasionally included in their programmes a paper or talk on recent advances in some fundamental topic, not necessarily directly concerned with metal finishing.

Throwing Power in EFCO-UDYLITE BRIGHT NICKEL SOLUTIONS

By P. MEULDIJK*

(A Paper presented to the Distributors' Conference organized by the Electro-Chemical Engineering Co. Ltd., at Weybridge, October 2, 3 and 4, 1957)

THE intention of this paper is not to give a scientific report on throwing power in Efco-Udylite bright nickel solutions, but to give a better picture of the influence of different conditions on the distribution of the nickel deposit. The intention was to obtain an idea of the conditions and concentrations of both components under which an optimum result with regard to the throwing power of the solution could be achieved. Moreover some dull nickel solutions were also tested for comparison.

The tests were carried out in a rectangular cell of the following dimensions : 250 x 75 x 80 mm. On both short sides of the cell means were provided to attach a flat cathode, for which brass sheet was used. The exposed area on each cathode was 48 sq. cm. A gauze anode was placed in the cell in such a way that the distance from the furthest cathode was exactly 4 times as great as the distance to the nearest cathode. Three ammeters were placed in the circuit of which one controlled the total current in the anode supply. The other two were used to read the current through each of the cathodes. Conditions and concentrations during the tests could be maintained fairly accurately. Test panels were weighed before and after the tests.

Before weighing, the panels were cleaned with trichlorethylene, and after weighing the further cleaning before plating resulted in a loss of less than 1 mg. per panel. Corrections for this loss were made.

Preparation before plating consisted of :—

1. Cold cathodic cleaning for approximately 1 minute.
2. Cold rinse.
3. Dip in sulphuric acid (5 per cent.) for 10 seconds.
4. Cold rinse.

For comparison of the results a graph was calculated with the following formula :

$$T = \frac{A}{B} \times 100$$

in which T = factor indicating the throwing power of the solution.
A = weight of deposit in mg. of furthest panel.
B = weight of deposit in mg. of nearest panel.

As the ratio of the distances was exactly 4 : 1, for A and B, a ratio of somewhere near 1 : 4 could be expected for the weights. An exact ratio of 1 : 4 results in a value for T of 25 per cent. and, therefore, values below 25 per cent. were termed unfavourable, and those above 25 per cent. favourable.

The first series of tests dealt with three dull nickel solutions, a dilute solution, and both the sulphate and high-chloride solution without any addition agents, and should give an idea of the influence of the inorganic components. In this series the last two solutions have also been tested at various *p*H values, temperatures and current densities.

The second group of tests shows the influence of addition agents. The components of the Udylite 514 solution were added one after the other in a series of steps and all T-values were calculated.

After this a third group of experiments was made to determine the influence on the T-value of contaminants, such as zinc, lead, grease, etc.

Finally the T-values of a 514 solution in perfect condition, and one of a contaminated solution, under the same conditions, were determined for comparison.

In all cases the time of the tests was exactly 15 minutes.

First Group.

Influence of Solution Composition and Total Current.

(a) Three solutions were tested at different total currents.

The solutions contained :

	I.	II.	III.
Nickel sulphate	150 gm.	300 gm.	100 gm.
Nickel chloride	30 „	60 „	200 „
Boric acid	30 „	40 „	40 „
*p*H	4.5		
Temperature	50°C.		

*Plating-Chemie, N.V.

In general with all solutions a lower T-value was obtained with increasing current,

After this test, solution I was discarded and the rest of the test deals only with solutions II and III.

(b) The solutions II and III were further tested at different temperatures. The total current was maintained at 3 amp. and the *p*H at 4.5. Both solutions gave higher T-values at 50°C. as compared with both the lower and higher temperatures.

(c) The final tests in this series dealt with the effect of the *p*H at a temperature of 50°C. and a total current of 3 amp. Both graphs have a slight maximum at *p*H 4 to 4.5, but it is not certain whether those values are due to experimental errors or not. In general the effect is not significant.

In summarizing (a), (b) and (c) it is found that in *all* cases the high chloride solution gives a better T-value. Variations in T-value are relatively small for temperature or *p*H changes in the normal working range. A remarkably high T-value can be obtained at low currents in the high chloride solution.

Second Group

All tests in this group were performed at 50°C., *p*H 4.5 with a total current of 3 amp.

(a) Udylite Brightener 22 was added to solution II and III and tested at different concentrations.

The first addition resulted for both solutions in a decrease of T-value, further additions giving a slight increase again.

(b) The solutions II and III with 5 ml per l. Brightener 22 were used to test the influence of Brightener III.

No remarkable changes took place with increasing concentrations of Brightener III.

(c) Next to be tested was Brightener 2-RL, which was added to the solutions No. II and III each containing 5 ml. per l. Brightener 22 and 8 gm. per l. Brightener III. Although an increase of the concentration of 2-RL did not produce a big effect on the T-value, the latter definitely decreased with an increase of this brightener.

(d) Finally the T-value of the No. 322 solution with increasing Brightener 41 concentration was determined. Addition of Brightener 41 did not cause any pronounced changes of T-value.

Summary

No surprising changes of T-value take place with the addition of brighteners. The general trend however is a slight decrease in throwing power which is very noticeable when comparing the values for the complete 514 solution (25.0 and 25.6) with the values of the same solutions under the same circumstances without any addition agents (26.7 and 27.2).

Third Group

Next the influence of different contaminants upon the T-value of the 514 and 514 H solutions was investigated.

(a) *Zinc.*

This metal was added in concentrations of 25 to 50 and 100 mg. per l. of metallic zinc.

After an initial small decrease, the T-value slowly rises to its "pure value" again. For the first time a T-value below 25 was found.

(b) *Copper.*

In the pure 514 and 514 H solutions 25 to 50 and 100 mg. per l. of metallic copper were dissolved. In the high-chloride solution the T-value remained practically constant, in the sulphate solution slightly higher T-values were obtained with higher copper content.

(c) *Lead.*

This was added next to the pure solutions, also in the concentrations of 25 to 50 and 100 mg. per l. of the metal. For both solutions this resulted in a decrease of T-value ; the 514 solution again reached values below 25.

(d) The effect of chromic acid in concentrations of 5, 10 and 25 mg. per l. (as chromic acid) was determined.

A definite decrease of T-value was obtained, especially with the higher concentrations at which for both solutions values below 25 were achieved.

(e) Stearic acid was used to test the effect of organic materials upon the T-value.

The 514 solutions gave a slight decrease reaching a value of 24.8 (25.0 for pure solution) at a concentration of 100 mg. per l. of stearic acid. The results obtained with the 514 H solution were very confusing. In practically all cases duplicate tests resulted in approximately the same values, but in the case of stearic acid in the 514 H solution the values obtained diverted so much that it was not possible to give a definite conclusion about the effects. Most likely, however the results will be parallel with those of the 514 solution.

Summary.

In general the effect of metallic contaminations does not seem to affect the T-value very much, except for lead which gives a definite decrease.

Chromic-acid additions result in a pronounced lower T-value ; stearic acid has only a slight unfavourable action.

To obtain an impression of the results with a seriously contaminated solution, a duplicate test was made with a purified 514 solution. After this test which was carried out under favourable conditions ; pH 4, temperature 50°C., current 3

(*Continued in page* 494)

"AIR-CONDITIONED" HANGAR FOR FINISHING BOEING AIRCRAFT

Man-made "Breeze" Provides Optimum Drying Conditions

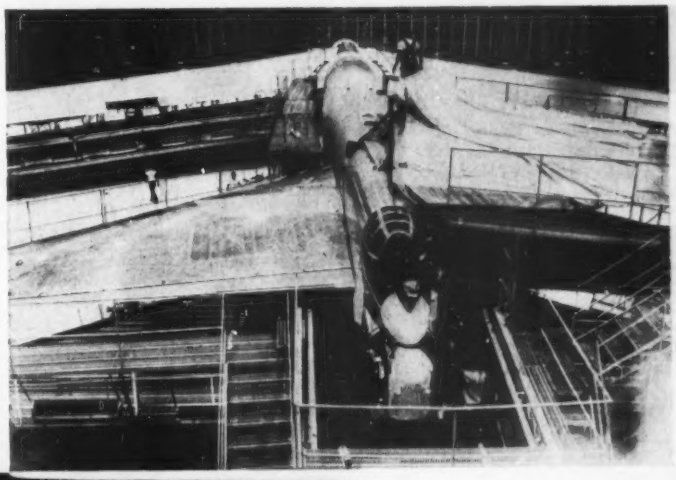


Fig. 1. General view of interior of hangar with aircraft in position. The doors in the background act as an air-filter.

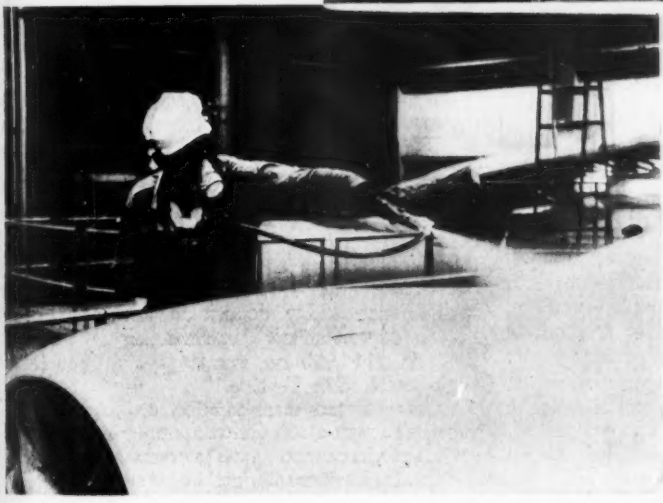


Fig. 2. White finish being applied to the engine nacelle of a Boeing B-52.

"HURRICANE hangar" is a name coined by workers at the Boeing Airplane Company, U.S.A. to describe a building, in which a crew of 22 men apply some 95 gallons of paint to each new B-52 Stratofortress after it rolls off the final assembly line.

The name is appropriate, because the hangar uses mercury-vapour lights and a man-made breeze moving at the rate of 760,000 cu. ft. of air per minute, to provide the exact drying conditions specified for finishes on high-altitude bombers which must fly at ultra-high speeds in virtually all weather conditions.

The corrugated steel building itself is not large (being only four stories tall and 323 ft. long), but it has plenty of room for one B-52 or two B-47 airplanes. Its appearance is somewhat squat and irregular due to the external locations of its air supply and exhaust facilities, many of which were installed before the building's outside wall sections were in place.

A uniform flow of dirt-free air through the hangar is made possible by use of the entire front of the building as a very large air filter. This is an inner door parallel to the main hangar door and located about 20 feet inside it. Except for a steel

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Finishing Boeing Aircraft

(*Continued from page* 493)

framework, the inner door comprises 3,800 filter panels, 2in. thick, mounted double. As each panel is only 19½ in. by 24½ in., replacement is easy and economical.

In all, the wall-sized air-cleaner door provides 6,304 sq. ft. of filter, 4 in. thick. Both inner and outer doors are in modified telescoping sections which slide on floor tracks to pocket positions at each side when an airplane is rolled in or out.

Eight blower fans at the sides of the building draw air from the outside. It enters through oil-dipped filters mounted on rollers, and through panel-type steam heaters (thermostatically controlled) to warm the air when necessary. Air is then forced through overhead ducts into the space between the doors, and out through the filter doors across the full width of the hangar so removing paint fumes at their source and assuring uniform drying action.

Air is drawn to the rear of the hangar by two decks of exhaust fans. A lower deck of ten blowers pulls spray-laden air through waterfall enclosures where the flow is 80,000 gallons per minute. An upper "dry" deck of ten more exhaust fans draws air through woven metal filters.

When an airplane is backed into the hangar, its surfaces are first cleaned thoroughly with water and naphtha. A solvent wash is also applied where needed. A network of 30 floor drains carries all waste wash away quickly.

After being air-dried, inner and outer surfaces (except those key control areas with built-in finish) are sprayed with an anti-corrosion primer undercoat. On the exterior, about 30 gallons of corrosion-an-erosion-resistant aluminized paint are applied to the upper surfaces of the airplane. Two coats of heat-reflective white enamel — a total of some 40 gallons — are applied to the under-sides and nacelles. While one paint is being sprayed on, other areas are covered with canvas and brown wrapping paper carefully edged with masking tape.

As many as 15 skilled paint-gun operators, wearing hoods and filter masks, are in action at the same time. About five gallons of red, yellow, white, black, blue and orange paint are applied (*via* stencils) for access identification etc.

On most interior surfaces, a tinted primer coat does the entire job. Special colours are applied to crew areas to reduce psychological human fatigue. There are many other cleaning and touch-up jobs inside, plus the accurate placing of some 2,500 decals (both metal and paper) to identify components and procedures for maintenance and flight crews.

As a fully integrated shop, the hangar has service rooms for paint storage, files of decals, control panels, offices and lockers. The ceiling over the painting area incorporates water sprinklers. A network of scaffolding around the airplane is partly fixed, partly portable, much of it laced with compressed-air supply lines and explosion-proof light tubes.

Throwing Power in E.U. Bright Nickel Solutions

(*Continued from page* 492)

amp., the following contaminants were added: 25 mg. per l. of zinc, copper and lead respectively.

Further 25 mg. per l. of chromic acid and 100 mg. per l. stearic acid were added. Moreover the concentrations of the normal addition agents were increased to the following values:

Brightener 2 RL : 1.5 ml. per l.
Brightener 41 : 6 ml. per l.

Another duplicate test was made.

Results : Pure solution T = 25.0 to 25.4
contaminated solution T = 29.3 to 29.6

This result is rather surprising and the only likely explanation for this phenomenon is that a comparatively high percentage of the contaminating metals will co-deposit in the low-current-density area. These metals have a higher depositing rate per amp. per hour than nickel, and hence can cause the relatively high weight of the deposit at low current density.

The experiments lead to the following conclusions:

1. There was not a great *practical* difference between the results of the different tests. At a high current density, average deposit of 40 microns, a T-value of 25 means an average low-current density-deposit of 10 microns while a T-value of 30 would indicate a 12 microns deposit. An *x* per cent. higher T-value results with the same high-current-density deposit in an *x* per cent. heavier deposit at low current density.
2. The 514 addition agents gave in general a slight decrease in T-value.
3. Contaminants seem to effect a decrease in T-value, although a solution containing a mixture of several contaminants gave a remarkable higher T-value than a pure solution. For practical purposes however neither addition agents or contaminants gave an indication about the conditions under which a higher T-value could be obtained.
4. In practically all tests the high-chloride solution gave slightly higher T-values than the sulphate solution.
5. It might be of interest to continue these tests with other solutions. When a definitely higher T-value could be obtained, it would mean a possibility of saving considerable nickel.

Production of Perforated Sheet-Metal Components by Chemical Etching

A QUICK, relatively inexpensive method called " Chemi-Cut " for producing sheet-metal stampings by a chemical etching process has recently been developed by the American Chance Vought Aircraft, Inc., as a substitute for the conventional metal removal methods of drilling, routing, and blanking or piercing.

By using the " Chemi-Cut " method, in principle like that used by photo engravers, the company makes sheet-metal stampings without the aid of mechanical dies and eliminates set-up costs ordinarily involved in mechanical metal removal methods.

With this process, metal parts can be made by first creating a black and white master drawing in any scale that will give complete details of the part. This drawing is then transferred to the desired metal by photo engraving, metal lithographing, or silk-screen printing, using a specially developed acid-resisting ink or compound.

The unwanted material not covered by the acid resist is then etched away, using suitable chemicals, and the remaining metal becomes the desired part. This process is particularly valuable in making large numbers of intricate parts of odd shapes.

One operation in which the company found the new process useful was as a substitute for welded screen assemblies. In this instance, a power plant generator air-screen as originally designed consisted of a frame and six welded screens of which each individual wire strand had to be spot welded. In some cases these strands came loose and presented a definite hazard of eventually entering the engine. This existing assembly had 216 spot welds.

As a redesign Chance Vought produced a Type 302 stainless-steel strip with all screening integral, all holes cut out, and even the part shape cut out in the " Chemi-Cut " operation. This strip required no burring nor any other operations than the etching to make it usable. Time from making the drawing to the first finished part was less than three hours.

Cost studies have indicated that where the new method is used, up to 80 per cent savings per part cost can be realized.

Other applications of the process, which has wide manufacturing possibilities, included making stencils for marking electronic chassis and various other parts out of 0.005-in. brass shim stock. Stencils made by the " Chemi-Cut " method are relatively inexpensive, durable marking devices, and are much more economical than paper or metal decals and certainly neater than hand lettering.

The company needed a copper wire circuit laminated between layers of Fiberglass cloth. Made by the conventional method, the cloth had a protrusion on its exterior due to the diameter of the wire. The problem was to reduce the cross-sectional area of the wire without decreasing the current-carrying capacity. The circuit was etched from flat copper sheet stock, bonded to a 0.003-in. soft Fiberglass cloth that would conform to any contour and then laminated between layers of Fiberglass.

This resulted in reduction of wire diameter from 0.016-in. to 0.005-in. and eliminated the protrusions.

Chance Vought is able to produce parts by the " Chemi-Cut " method having a maximum dimension of 27 by 30 in. By close nesting of each part on a sheet of this size, almost any number of parts can be made in a relatively short time. It is estimated that about 90 per cent of the sheet stock can be used effectively by this method as compared to 75 per cent for mechanical stamping methods.

The company in co-operation with a local source developed two specially compounded acid resists which it uses to coat metals to be etched. With suitable prepared etchants, about 0.001 in. per minute can be cut, and by increasing the base etching temperature by 20° F. the etching time can be cut in half.

Aluminium, copper, bronze, brass, steel, beryllium, titanium and chrome plated sheet stock are some of the materials that can be " Chemi-Cut " and the physical properties of the material will not be affected. Parts up to 0.006 in. thick can be produced with a vertical edge. Parts thicker will have a minute shoulder with a radius roughly equal to the depth of the etch.

The company at the present time is limiting the " Chemi-Cut " process to a maximum etching thickness of 0.040 in.

Advantages of the new process for limited or quantity production, over conventional die punching of sheet-metal parts, include :—

1. Cost reductions results from elimination of a large percentage of labour and handling.

2. Assembly and inspection times are reduced and rejects minimized since the geometric part pattern is always exact.

(*Continued in page* 496)

PROGRESS IN BRIGHT TIN PLATING

Work at T.R.I.

THE advantages of a method of electrodeposition of tin which would produce a coating with a really bright finish have long been appreciated, and many researches having this objective, have been reported during the last twenty years. About two years ago the problem was once again studied in the plating laboratories of the Tin Research Institute, and a brief note concerning progress in the research is contained in the current issue of the T.R.I. Quarterly Journal "*Tin and Its Uses.*"

Work in America had established that some wood tars were capable of influencing the brightness of tin deposits and the work at T.R.I. has attempted to isolate the active principles from such tars. Sufficiently rewarding results were achieved with certain tar extracts to justify a progress report on the research, and a paper on the subject by Harper, Mohan and Britton was presented at the 1957 Conference of the Institute of Metal Finishing.

A 20-gallon stannous sulphate plating bath containing the brightening addition has been operated at the Institute satisfactorily for over a year and seven firms have been supplied with sufficient quantities of prepared addition agent for trials in their own works.

The degree of brightness obtained is good and approximates under the best conditions to a polished surface, although under less favourable conditions it appears polished, but slightly misted. One of the main advantages of a bright finish is its freedom from finger marking. There is however, clearly considerably more information required concerning the action of the brightening agent and the research is continuing.

New Airless Spray Equipment

(*Continued from page* 487)

air like materials applied with pneumatic spray equipment.

Finishing operations are being completed about two to four times as fast as could be expected if standard spray equipment was employed, not only because the low solvent content of the paint used permits the build-up of a relatively thick coating in one pass, but because the airless equipment makes it possible to use 150-ft. long finishing hoses.

At the end of a day's work, the equipment can be cleaned in about 10 minutes by pumping solvent through the paint lines until clear solvent emerges from the spray guns.

At the time this article was written about 20,000 gallons of mill-white had been applied with airless equipment and although the results were not always perfect, since there were a few "teething troubles" that had to be eliminated, they have been consistently good.

Men experienced in the use of conventional finishing facilities usually complain when they are initially assigned to work with airless equipment, but it has been found that their attitudes undergoes an abrupt change within a day or two. This is because :

(a) They find they can get more work done with less effort. (For example, they are able to finish many hard-to-reach wall and ceiling areas without erecting scaffolds).

(b) They discover their jobs are cleaner and healthier. (Reduced quantities of overspray and solvents, for instance, mean less irritation for skin and eyes).

Zinc, Copper, Nickel and Chromium Plating

(*Continued from page* 484)

Conclusions

1. With the exception of chromium which gives a rapid change in the covering power, most of the metallic impurities in nickel plating baths only cause a very slight and progressive rise in the covering power of the chromium plating bath.

2. For all the metallic impurities, a visible change in the nickel deposit appears long before the concentration of the impurity causes a marked rise in the covering power of the chromium plating bath.

As a consequence, when the covering power of a well-controlled chromium plating bath markedly increases, without any serious change in the appearance of the nickel, the change can be ascribed to an organic contamination.

3. An efficacious method of elimination exists for each metallic impurity and this method can be used in the case of accidental contamination, but the classic method of elimination by electrochemical displacement and selective electrolysis remains the best.

Production of Perforated Components

(*Continued from page* 495)

3. Parts are uniformly reproducible. There is no deviation between parts since all are made from a master pattern.

4. Any part configuration can be made, limited only by the part size and requirements.

5. Design changes during production runs can be easily and inexpensively made by revising the engineering drawings and changing the master drawing.

The economic advantage of "Chemi-Cut" stamping does not necessarily depend upon the cost of each stamping but on the relative cost of this method as compared to mechanical methods of producing a similar part.

FINISHING NEWS REVIEW

HOT-DIP GALVANIZERS TO MEET IN BRUSSELS

1958 World Fair is the venue for 5th International Conference

THE Fifth International Conference on Hot Dip Galvanizing will take place in Holland and Belgium from June 22 — 27 next year under the patronage of the Brussels World Fair and will be similar to the previous conferences held in Copenhagen, Dusseldorf, Oxford and Milan. The conference will be organized for the first time by the European General Galvanizers Association : the national galvanizers associations in the Benelux countries are making all local arrangements under the auspices of the European Association ; and the Zinc Development Association, as secretariat of the E.G.G.A., has undertaken responsibility for the printing.

Choice of Venue

Brussels, where the technical sessions will take place, is not only the capital of Belgium, but also the leading industrial and commercial centre of the country. Seventy-five miles from the coast, it is connected by excellent road, rail and air services with all the chief cities of continental Europe. For these and other reasons it has been chosen as the site of the 1958 World Fair, whose organizing authorities have sanctioned the holding of the International Galvanizing Conference.

The Brussels World Fair — the first since the New York World Fair of 1939 (see page 498 of this issue)— will attract visitors from all over the world and is being supported by some 50 sovereign states. The Fair, whose theme is " Human Progress through Technical Progress," will be held on a site on the Heysel Plateau adjoining the royal park of Laeken outside Brussels, and will occupy an area of over 500 acres. The planning of the Galvanizing Conference will allow delegates the maximum opportunity for visiting the Fair and enjoying the facilities provided by it.

Before travelling to Brussels for the technical sessions, the reception and registration of delegates will take place at Scheveningen, an attractive summer resort on the west coast of Holland very close to The Hague, a situation which makes it an ideal rendezvous from which to visit Dutch galvanizing plants.

Programme

The technical sessions will be held in Brussels from June 24-26, and will be preceded by works visits in Holland and followed by similar visits in Belgium. In addition, the national galvanizers associations in the Benelux countries will give receptions in their own countries at which delegates and their ladies will be their guests. The Conference proceedings will be concluded with a banquet in one of the leading restaurants of Brussels.

Application forms for the Conference can be obtained from :
European General Galvanizers Assoc., Secretariat: Zinc Development Assoc., 34 Berkeley Square, London, W.1.

A special programme of excursions to places of interest in both Holland and Belgium will be provided for the ladies.

In conjunction with the Conference, an exhibition of galvanizing plant equipment is to be held by plant manufacturers in the same building as the technical sessions and delegates will have the opportunity of seeing photographs and literature illustrating the latest improvements in galvanizing plant.

Scope of the Papers

The arrangement of papers within each session in the 1958 Conference will be slightly different from previous years. Each session will be devoted to the discussion of one main paper and two or three subsidiary papers which will have been written when their authors have had the opportunity of studying the main paper. In most of the sessions the subsidiary contributions will take the form of a commentary on the principal paper.

As the Conference is being held under the patronage of the Brussels World Fair the technical papers are required to illuminate the theme of the Fair. For this reason two sessions will be devoted to papers on this theme — the first being written by Belgogalva and the second by the Z.D.A. The complete schedule of papers is as follows :

Human progress through Technical Progress—1.
Preparation of Material for Galvanizing.
Comparison between the Cook-Norteman and Sendzimir Processes.
Relative Merits of Wet and Dry Galvanizing.
Bath Heating.
Variations in the Characteristics of Steel Wire as a Result of Hot Dip Galvanizing.
Effect of Impurities and Additions on the Galvanizing Bath.
Non-destructive Testing of Galvanized Coatings.
Human Progress through Technical Progress—2.
Materials Handling.

Accommodation

Hotel accommodation in Scheveningen will be arranged by the Dutch Associations and Belgogalva will reserve rooms in hotels and motels in or near Brussels. Full details of the hotels and prices together with a reservation will be included in the provisional programme for the Conference which is to be issued some time next month.

Conference Fee

The Conference fee covers preprints of papers, the provisional and final programmes, and a final bound report of the proceedings including not only the papers but also a full account of the ensuing discussions. This fee, which will be £20, covers in addition all expenses such as the cost of buses to take delegates on works visits, but does not include the cost of accommodation or of the special train which has been reserved for the benefit of delegates not travelling by car from The Hague to Brussels. For ladies accompanying delegates, the fee will be a little over half this amount.

Hard Wax Coatings for Tubes

A NEW process for wax-coating the internal walls of collapsible metal tubes has been introduced recently at the Silvertown works of Venesta Ltd. Using new machines of American design exclusive in this country to Venesta, the coating is "flush" applied instead of sprayed as in the method previously used. The flush-waxing system makes possible the use of waxes having much higher melting points.

A main advantage of the process, is that it can be carried out after the tube, already printed and capped, has left the flow line. Subsequent handling and exposure to air sustained by the tube is minimized; and the danger of dust settling on the coating is almost negligible.

The process is not confined only to collapsible metal tubes, and rigid containers can also be treated. The article to be coated can be made of any metal, but at present there is a size limitation of a ½-in. to 1½-in. on the diameter that can be handled.

New London Showrooms

TWO themes are stressed in Sankey Sheldon Ltd.'s new showroom, recently completed at their London headquarters, 46, Cannon Street. They are colour schemes for the office (for which the firm now offers an advisory service) and floor-space utilization with a movable steel partitioning. The showroom is shown above.

The ground floor has been redesigned. With the use of full-width mirrors and contemporary-style lighting a modern setting is provided to display a range of the latest steel office and constructional equipment, including desks, chairs and systems. Side walls of the room are lined with Sankey Sheldon's "LP" type flush steel partitioning, both glazed and solid, in a range of colours.

On other floors, customers can now inspect products in use in the appropriate departments of the firm's own organization. Reconstructed rooms display additional colour schemes. There is an executive suite containing some of the recent designs of Sankey Royal square-tube chairs.

Joint Meeting on Instrumentation

A SYMPOSIUM, jointly organized by the Institution of Chemical Engineers, the Society of Instrument Technology and the British Computer Society, on instrumentation and computation in process development and plant design, will be held in London in the summer of 1959.

Enquiries should be sent to the Secretary of the Institution of Chemical Engineers, at 16, Belgrave Square, London, S.W.1.

BRUSSELS EXHIBITION

A CINEMA to hold 200 people will be a feature of the British Industrial Pavilion at the Universal and International Exhibition to be held in Brussels from April 17 to October 19 next year.

For a reasonable charge, any British firm, whether exhibiting or not, can rent the cinema from the sponsors, the Federation of British Industries, 21, Tothill Street, London, S.W.1, to show 16 mm. or 35 mm. industrial films.

It is expected that the Brussels exhibition will be the biggest of its kind since the 1939 World Exhibition in New York, and the cinema should have visitors from many parts of the globe.

Entertainment of a different kind will be obtainable at the Britannia Inn, a modern, two-storey counterpart of an English pub to be built in the grounds of the pavilion by Whitbread and Co., the London brewers. In the proposed plans for the building, the dominant theme of the interior decorations and furnishings is Britain's dependence on ships and the sea for her commercial strength and greatness.

MOTOR EXHIBITION EXPORT SUCCESS

NEARLY half-a-million people passed through the turnstiles at Earls Court during the 42nd International Exhibition held recently at Earls Court. Of these, 15,000 came from overseas. While the show was still on, some manufacturers of the cars on view announced orders from the North American market alone totalling more than 60 million dollars.

Throughout next year, in addition to the regular sailings, an extra vessel will sail each week with a full cargo of cars to cope with the increased flow.

Laboratory makes the Grand Tour

An interior view of the mobile laboratory

ON October 25, representatives of George Kent, Ltd., set out for the Continent with a large mobile exhibition of their firm's products to visit customers' works and to participate in technical conventions. The company feels that the specialist exhibitions at home and abroad are insufficiently widespread to enable the distant customer to keep abreast of rapid development of a wide range of new instruments.

Coach-built on a lengthened Dodge chassis and powered by a 4.73 litre diesel engine, the vehicle has an overall length of 32 ft. and a kerb weight of approximately 7 tons.

The panelled and carpeted interior is electrically heated and contains a range of instruments to cover most industrial applications.

A small electric furnace has been included for use with temperature recording instruments. The firm's aircraft-fuel meters are also being displayed as well as a variety of miniature electric motors for the scientific industries.

Beneath the floor of the vehicle, a mains-driven air compressor plant has been installed to supply the air-operated control instruments, and there is a 24-V battery-driven rotary generator to provide a standby supply. While running on the mains supply, both vehicle batteries and those carried for the generator can be charged through a battery charging unit.

Sales Agreement

UNDER a new agreement made on terms acceptable to both parties the Wilmington, Del. (U.S.A.) firm of E. I. Du Pont de Nemours and Co. Inc., has modified the arrangements under which Durham Raw Materials, 1-4 Great Tower Street, London, have been the sole distributors of Neoprene in the United Kingdom.

The American company has formed a subsidiary, the Du Pont Co. (United Kingdom) Ltd., 5 Charles II Street, London, S.W.1. to manufacture and sell Neoprene in Britain and other European markets.

The changeover is in two parts, spread over a year. From January 1 next, sales of Neoprene will be made in the name of Du Pont, with Durham Raw Materials Ltd. acting as sales agents. On January 1 of the following year, the Du Pont Co. will assume full control of all Neoprene sales.

Du Pont de Nemours say the reason for the change now that Neoprene is to be made in the U.K. is solely that they wish to handle their own sales from this plant.

Neoprene, one of the first commercially successful synthetic rubbers, is used extensively in moulded and extruded rubber goods, and for adhesives and protective coatings.

New Division

THE formation of a new division to sell the company's adhesives and sealants was announced recently by Furane Plastics, Inc., 4516 Brazil Street, Los Angeles 39, Ca., U.S.A. The division will be backed by a production research and development group, staffed with technically qualified engineers, to provide a wide field service. The marketing manager is Mr. Rex D. Brookhart.

STOCKPILE ZINC

THE Board of Trade are offering about 9,000 tons of zinc from the government stockpile for delivery and pricing between December and February. Two thirds of this will be offered to the original suppliers and the remainder put up for competitive tender.

U.S. FELLOWSHIP CHANGES TITLE

THE memory of the late Oscar Hommel, founder of the Pittsburg (U.S.A.) firm of O. Hommel Co., was honoured recently when the official title of the Ceramic Chemicals Fellowship sponsored by the company at the Mellon Institute of Industrial Research was changed to the Oscar Hommel Memorial Fellowship.

The fellowship was originated by Oscar Hommel in 1933 to improve ceramic products, and the development of titania opacified frit was developed under its auspices.

Two holders of the fellowship who have distinguished themselves in the field of ceramics have been Dr. E. E. Marbaker, appointed in 1940, and the present holder, Dr. John Cox.

Danish Bath

ONE of the largest galvanizing baths ever made was recently completed in record time by Thompson Bros. (Bilston) Ltd. for a Danish galvanizing company, Christian Logstrup of Randers.

The bath is more than 31 ft. in length and is flared at one end. Side plates used for construction are 2-in. thick, and the bottom is 1½-in. thick. When filled, the bath will contain 136 tons of molten zinc for the hot-dip galvanizing of mild steel power-line structures.

Around the World in Fifty Days

THE recently-appointed overseas controller of British Titan Products Co. Ltd., York, Dr. P. A. Lintern, has been visiting the Tasmanian works of Australian Titan Products Pty. Ltd., at Burnie, where a £2½-million expansion programme is under way. The British parent company is providing a large share of this capital.

The original plant at Burnie, designed to produce 1,800 tons of paint products a year, began operating in 1949. Since then, production has climbed steadily, and recent extensions will soon raise output to 10,000 tons per annum. The new expansion programme will double even this productive capacity.

On the outward journey, Dr. Lintern had discussions in India with the directors of Travancore Titan Products about future expansion, and with raw materials suppliers.

On the return trip, he visited the United States before his return to Britain early this month.

Birmingham Metal Finishers' New Catalogue

OPEN competition in the proposed European free trade area will mean that Britain will have to sell her goods in a market where publicity for her wares will become increasingly important. Many of the continental houses spend large sums on lavishly produced catalogues and brochures, and so when one of our own industrial houses decides to improve its own catalogues, it is in the interests of us all.

W. Canning and Co. Ltd. have been in business since 1785, when the firm began selling industrial salts for the growing industries of the Midlands. Their works were in the jewellery area of Birmingham, so that it wasn't long before they became interested in the silver plating processes of Elkington's of Birmingham and Walker and Hall of Sheffield. When, later, the nickel plating process was introduced, the business developed considerably, and in 1886 Canning's became interested in a low voltage plating dynamo patented by Hemming. From this point on, the firm expanded to the important position it now holds in the metal finishing industry.

Since 1939, when the forerunner of the recently issued edition last appeared as a bound edition, Canning's have supplied literature about new developments to their customers in the form of loose-leaf folders. The new catalogue is a well-produced indexed and bound volume of the many products connected with the plating and metal finishing industries made by Canning's.

Nickel Supplies to Meet the Demand

USERS of nickel in this country heard good news recently from the President of the International Nickel Co. of Canada who said that supplies of nickel would shortly be available to meet all demands. To British manufacturers of stainless steel, the news is particularly welcome. For some time now a shortage of nickel has severely hampered production, and adequate supplies will mean that producers can plan ahead.

Mr. Wingate was speaking at a conference held in London, attended by the company's chairman, Dr. John F. Thompson, and other senior members.

Details of the present position of the "Inco-Mond" group of companies and their future plans were revealed. By 1960, the total free world nickel capacity may be of the order of 6 to 6½ hundred-million lb.

In addition to the five mines already being worked in Ontario, the company plans to open one new mine there and two others in Manitoba. In Great Britain, some of the nickel oxide sinter from the Canadian mines is refined by the Mond Nickel Co. at Clydach in South Wales. At Acton in London, platinum and allied metals are extracted, and a subsidiary company, Henry Wiggin and Co. Ltd., Birmingham, produces nickel and nickel alloy sheet and sections.

University Chair

A CHAIR in chemical metallurgy has been established by the International Nickel Co. Inc. at Colombia University, U.S.A. The Chair is endowed by a grant of $350,000, and a gift of $75,000 was made for special expenditures incidental to the establishment. Two ex-chairman of the company, both graduates of Columbia's School of Mines, have been honoured in the title of the "Stanley-Thompson Chair."

The first incumbent is Dr. Jack Henry Schulman, O.B.E., of Cambridge University, a fellow of Trinity Hall and Reader in Surface Chemistry, who has already begun his new duties. Mr. Henry S. Wingate, International Nickel's president, made the grant on behalf of the company.

TECHNICAL BOOKSHELF

Fifteen Year Exposure Test of Porcelain Enamels. *Dwight G. Moore and William N. Harrison, National Bureau of Standards Building Materials and Structures Report* 148, 13 *pp.*, 15 *cents. (Order from the Superintendent of Documents, Government Printing Office, Washington* 25, *D.C.).*

The Bureau has been testing weather resistance of procelain enamels by exposing a large number of samples to four climatic conditions, representatives of different parts of the eastern United States. Results of the study should be useful to enamel manufacturers in further improving the weather resistance of porcelain enamels and to architects and engineers in specifying the best weather-resistant compositions.

Large variations were found in the weather resistance of the various enamel types investigated. The enamels affected least by the exposure were those having high resistance to acid attack. The most resistant enamels retained more than 90% of their initial gloss and showed insignificant colour changes (less than 1 NBS unit) while some of the enamels of poor acid resistance (which were not of a type recommended for outside exposure) changed from full gloss to a dull finish in 15 years.

Among the recommendations based upon the findings of this investigation, the one that may prove to be of greatest usefulness for specification purposes states that, for architectural installations where general appearance, absence of fading, and ease of cleaning are important, only those enamels having class A or class AA acid resistance by the standard citric acid spot test should be used. In addition, for enamels containing the cadmium-selenium-sulphur pigment (red, orange, and yellow), only those compositions should be selected that will give a weight loss of less than 1.0 mg./cm.^{2} when subjected to a boiling solution of 10 per cent nitric acid for 2½ hours.

NOTE : *Foreign remittances must be in U.S. Exchange and should include an additional one-fourth of the publication price to cover mailing costs.*

Automation Show

THE Instruments, Electronics and Automation Exhibition to be held at Olympia in April, 1958 will be an international event with exhibitors from at least seven European countries and the U.S.A. The exhibition is being organized on behalf of the promoting trade associations by Industrial Exhibitions Ltd., London.

TECHNICAL *and* INDUSTRIAL APPOINTMENTS

Mr. E. D. Robinson, formerly assistant manager of London area sales office of the **Northern Aluminium Co. Ltd.,** Bush House, Aldwych, London, W.C.2, has taken up the appointment of area sales manager in charge of the Manchester office in succession to Mr. D. A. Corbett-Thompson who has been appointed sales manager in charge of export sales.

Mr. M. Bridgewater, who has just completed a year's study at the Centre d'Etudes Industrielles, Geneva, becomes manager of the sales development division, Banbury, with effect from September 30, 1957. He succeeds Mr. E. D. Iliff who has been appointed sales manager in charge of sales development, advertising and publicity.

* * *

The Aluminium Development Association, 33, Grosvenor Street, London, W.1, has appointed to its staff Mr. D. L. Jones in the capacity of road transport engineer.

Mr. Jones was at one time a senior designer with the Regent Oil Co. Ltd. He joined the Association from the Ford Motor Co. where he was responsible for design, development and construction of all road tank vehicles, pumping gear, ancillary equipment and special-purpose bodies.

* * *

The British Aluminium Co. Ltd., Norfolk House, St. James's Square, London, S.W.1, announce that Mr. P. S. W. Swabey has been appointed assistant general sales manager. At one time he was assistant development manager, and has had a considerable period of service with the company.

* * *

The president of the Board of Trade has appointed Major Richard Miles and Sir Owen Wansbrough-Jones, K.B.E., C.B., as part-time members of the **National Research Development Corporation** for three years, and has renewed the part-time appointments of Prof. R. M. S. Blackett, Mr. J. F. Lockwood and Sir Rowland Smith for a further two years, and Sir John Duncanson for a further one year.

Major Miles is chairman and managing director of the engineering firm of Head, Wrightson and Co. Ltd., and director of the Nuclear Power Plant Co. Ltd and other companies.

Sir Owen Wansbrough-Jones is Chief Scientist of the Ministry of Supply.

The National Research Development Corporation was set up by the Government in 1949 to develop and exploit inventions resulting from public research, and other inventions which are not being taken up by industry but which the Corporation considers should be assisted in the public interest. The Corporation has a large portfolio of inventions available for licence, and has a special interest in the development of electronic computers.

The last annual report of the Corporation for the year ended June 30, 1956, was published by H.M. Stationery Office on March 12, 1957.

* * *

Sir Edward Thompson, J.P., has been elected president of the **British Engineers' Association,** 32, Victoria Street, London, S.W.1. Sir Edward Thompson is chairman and joint managing director of John Thompson Ltd.

Mr. A. I. Baker, C.B.E., M.A., J.P., M.I.Mech.E., M.I.Prod.E., (chairman of Baker Perkins Ltd.) has been elected vice-president of the association.

The retiring president, Mr. W. K. G. Allen, M.I.Mar.E., A.M.I.N.A. (Chairman and managing director of W. H. Allen, Sons and Co. Ltd.), has been elected honorary treasurer.

Mr. R. L. Webster, chief personnel manager of Hoover Ltd., Perivale, Greenford, Mddx., has been elected president of the **Institute of Personnel Management.**

Mr. Webster joined Hoover Ltd. in 1938 to take charge of the personnel organization. He has played an increasing part in the company's affairs, and last year was made a director of Hoover (Washing Machines) Ltd.

He was recently made a member of the committee on pay and conditions in the prison service.

* * *

Vice-Admiral Sir Frank Mason, R.N., has been appointed consultant to the management of **Metropolitan Vickers Electrical Co. Ltd.,** following his recent retirement as Engineer-in-Chief of the Fleet.

* * *

Dr. A. L. Sutton, has left the G.E.C. Research Laboratories to take up an appointment with the U.K. Atomic Energy Authority (Industrial Group), Culcheth, in the metallurgical laboratories.

MEETINGS OF THE MONTH

December 17

Metal Finishing Association. Open discussion meeting. Luncheon meeting at the Farcroft Hotel, Rookery Road, Handsworth, Birmingham 21.

January 7

Institute of Metal Finishing (Midland Branch). "Effluent Problems," by F. Wild, at the James Watt Institute, Great Charles Street, Birmingham 3, at 6.30 p.m.

January 8

Institute of Metal Finishing (Organic Finishing Group). "Fire Hazards in Organic Finishing and their Avoidance," by L. A. Smith at the Royal Society of Tropical Medicine and Hygiene, 26 Portland Place, London, W.1, at 6.30 p.m.

January 9

Institute of Metals (Leeds Metallurgical Society). "Corrosion Problems and Water Treatment in Power Stations," by R. W. Wolforth, in Lecture Room "C", Chemistry Wing, Leeds University, at 7.15 p.m.

January 14

Institution of Mechanical Engineers (Automobile Division General Meeting). "The Prevention of Corrosion in Car Bodies," by Dr. T. P. Hoar, at 1 Birdcage Walk, London, S.W.1, at 6 p.m.

January 16

Oil and Colour Chemists' Association (Scottish Section). "Toxicity of Solvents in Industry," by Dr. R. Piper (I.C.I. Ltd.), at More's Hotel, India Street, Glasgow, at 7.15 p.m.

NEW COMPANIES

" Ltd " is understood, also " Private Co." Figures = Capital, Names = Directors, all unless otherwise indicated.

Claredon, 16, Wimpole Street, London, W.1. October 11. £100. To carry on bus. of stove and vitreous enamellers, etc. S. Silvester, F. H. Hale.

Stove Enamellers, 130 Bolton Road, Bradford. October 16. £2,500. G. S. Illingworth, S. Scaife.

Better Chrome, 32, Otley Road, Shipley, Yorks. October 17. £1,400. To carry on bus. of metal sprayers, chromium-platers, etc. C. Daune, B. E. Kitson, F. W. Marshall, D. Moses and J. S. Moses.

H. Cousins (Ripon), 6, North Street, Ripon. October 17. £100. To carry on bus. of manufacturers of and dealers in paints, enamels, varnishes, etc. H. Cousins and Mrs. D. Cousins, F. E. Metcalfe.

Talbot Plating Co., Old Row, Barrowford, Lancs. October 23. £3,000. C. T. Preston, Mrs. W. Orsnop.

Lubrichrom. October 24. £10,000. To enter into an agreement with Michael Cowan, and to carry on bus. of chromium-platers, etc. M. Cowan.

Linward Processes, 58, Brookside Avenue, Ashford, Middx. October 21. £100. To carry on bus. of specialists in industrial finishing and other processes, etc., E. G. Hall, L. J. Higgins.

Armoplast, 11, Peter Street, Manchester, 2. October 28. £2,000. To carry on bus. of electro- and silver-platers, gilders, etc. A. Barker, Geza I. Berger.

Metalife Corrosion. October 28 £10,000. To carry on bus. of manufacturers of and dealers in metal and wood preservatives, anti-corrosives, enamel, etc. J. Svendsen and H. C. Svendsen.

Sandpits Plating and Polishing Co., 140, Sandpits, Birmingham, 1. October 29. £2,000. G. H. Bennett, J. Pye.

Acorn Ano-Coil. October 29. £1,000. To carry on bus. of anodising metal and alloys, etc.

J. E. Johnson (Platers), 74, Church Gate, Leicester. October 30. £10,000. To take over bus. of electro-platers and metal finishers carried on at Leicester as " J. E. Johnson and Co.", etc. A. R. Barker, N. W. Tudor.

Chester Metal Co., Saughall Nurseries, Parkgate Road, Saughall, nr. Chester. November 5. £500. To carry on bus. of electro-platers, engineers, etc. M. R. Spall and Mrs. F. Hitchcock, T. F. Stannett.

B. H. Collins and Co., 38, Frederick Street, Birmingham, 1. November 5. £10,000. To carry on bus. of manufacturers of and dealers in badges, medals, and trophies, diesinkers, toolmakers, etc. B. H. Collins and Mrs. I. C. Collins.

Lewis Shepperson, 97, Outram Street, Sutton-in-Ashfield. November 6. £5,000. To carry on bus. of manufacturers of and dealers in paints, etc. L. Shepperson, J. D. Shepperson, A. E. Shepperson and Mrs. W. A. Shepperson.

From the Register compiled by Jordan & Sons Ltd., 16, Chancery Lane, London, W.C.2.

TRADE and TECHNICAL PUBLICATIONS

" Lectro-Nic Process " : A ten-page technical paper describing the Lectro-Nic compressively stressed nickel-plating process has been prepared by the Sel-Rex Corpn., Nutley, New Jersey, U.S.A.

Developed specifically as an undercoating to counteract rhodium electroplate's inherent high stress characteristics, the process described in this paper utilizes only one addition agent, with all other operating conditions being identical to conventional nickel plating.

The literature describes plating solution composition and operating conditions ; make-up and control of Lectro-Nic solutions ; analysis and properties ; and how to gauge the rate of consumption of the Lectro-Nic addition agent. Copies can be obtained free of charge from the corporation.

" New Hydrabrasive Grinders " is the name of a catalogue recently issued by the Abrasive Machine Tool Co., East Providence, R.I., U.S.A. It is a 6-page brochure fully illustrated in colour that gives comprehensive information about the company's recently introduced line of precision surface-grinders. It is available free on request.

" Furane for your Service " is a bulletin issued recently by Furane Plastics Inc., 4516 Brazil Street, Los Angeles 39, Ca., U.S.A. Organized in 1945, the company has steadily grown in size until it is now one of the leading plastic resin manufacturers on the West Coast of the U.S.A. The bulletin describes some of the fields of interest served by the company, and is available free on request.

" Platinum Metals Review " is a quarterly survey of research on the platinum metals and of developments in their application in industry, published by Johnson, Matthey and Co. Ltd., Hatton Garden, London, E.C.1.

In the latest issue, Vol. I, No. 4, some of the articles describe the creep-testing of platinum alloys ; special platinum alloy thermo-junctions ; the extraction and purification of plutonium metals ; and the alloys of platinum metals with boron, phosphorus, and silicon.

" Finishing Facts" published by the Paints Division of Imperial Chemical Industries Ltd., Slough, Bucks., appears regularly. The latest issue describes in an article written by C. S. Beers (Leisure Kitchen Equipment Ltd.) how his company has built up a business manufacturing and supplying porcelain enamel domestic ware. In the company's works at Long Eaton, near Nottingham, is installed what is claimed to be the largest porcelain-enamelling continuous furnace of its type in Europe.

Wall and base units of kitchen equipment built on the 21-in. module are made of electrolytically zinc-plated steel, pressformed to shape. After alkaline degreasing, the units are immersed in a chromic-acid rinse and then dried off. The subsequent painting process comprises dipping in a stoving primer, draining for ten minutes, and then stoving for 35 minutes at 325 to 350°F. in a gas fired camel back oven. This first priming coat is applied as a protection against storage and assembly operations. After assembly, the main panels of the unit are flatted, then sprayed with primer. Flashing-off and stoving periods are as for the first coat. Dry flatting follows, after which the units are given two coats of stoving enamel, line sprayed wet-on-wet. The finish is stoved at 350°F. for either 20 or 25 minutes depending on the colour used.

Latest Developments in PLANT, PROCESSES AND EQUIPMENT

Fire-resistant Buff

A NEW type of buff that completely eliminates the danger from fire has been introduced recently by the Schaffner Manufacturing Co., Inc., Schnaffer Center, Emsworth, Pittsburgh 2, Pa., U.S.A. The makers claim that this has been achieved by using an entirely new process to make the buff fire-resistant. Called the " Aircooled Fire Chief," the company invites inquiries for further information about it.

Pneumatic Wire Feed and a Safety Helmet

A NEW accessory for the metallizing guns made by Metallizing Equipment Co. Ltd., Chobham, Woking, Surrey, was introduced recently. The accessory comprises a small pneumatic cylinder and piston to take the place of the existing wire feed pressure screw and thus enable the feed to be stopped or started at will. The wire feed can be stopped whenever the gun is put down for any reason, and this not only economizes in the use of wire but also obviates having to switch off and relight the gun during " down " periods.

In operation the piston exerts pressure on the wire-feed rolls in the normal manner. A spring loaded, non-return device prevents the wire from being accidentally withdrawn from the nozzle when the air pressure is released, but the device can be over-ridden when changing the wire becomes necessary. No modification of the existing gun is necessary, and the unit is supplied ready to fit in place of the existing upper drive roll.

For semi-continuous operation where the gun is hand-held, a foot pedal controls the pneumatic wire-feed, but on automatic production lines a solenoid or cam-operated valve can be used in place of the foot control. If a control valve is used, any number of guns can be operated from the one valve

The gun is seen in use in Fig. 1, where another new product from this company is illustrated. The makers claim that the protective helmet shown gives a big improvement in the freedom of movement and vision available to the operator.

The preliminary function of the helmet is to provide fresh, clean air to an operator otherwise exposed to the hazards of dust and fumes when spraying toxic materials. Clean air is fed to the mask through an activated carbon filter element and a safety valve. The cartridge-type element will absorb many times its own volume of any oil vapour that may be present in the compressed-air feed. The wearer can quickly disconnect himself from the air supply during " down " periods and breathe freely without removing the helmet. The unit is supplied complete with all fittings and connections.

An important feature of the mask is the freedom of vision it affords. Made from light-weight, transparent material the mainhood is free from any contact with the head, and spectacles can be worn with complete freedom. The front visor can be replaced when necessary. Internal demisting baffles are fitted to prevent steaming-up. The baffles are arranged in such a way that the incoming air is also prevented from creating a draught.

Fig. 1.—A foot controlled pneumatic wire feed for a metallizing gun, and a new protective mask for use when toxic fumes are present.

Fig. 2.—Mixer for paint containers.

Paint Mixer

THE PEP mixing machine recently introduced by Engineering Tools and Product Design Co. Ltd., 126 Crossbrook Street, Waltham Cross, Cheshunt, Herts., is of patented design for efficiently mixing paint in 5-gallon drums and smaller containers down to 1-gallon round or rectangular cans. (Fig. 2).

The machine incorporates pairs of eccentric cams mounted angularly on a horizontal shaft driven by a ⅓-h.p. motor to give a combined shaking and rotary movement to the containers being treated.

In use, the containers are placed directly on the cams, which can be adjusted to accommodate varying drum lengths.

Various types of adaptor drums are available for special use, for example, when square or rectangular containers have to be treated.

Shot-blasting Pellets

SHOT-blasting plays an important part in the manufacturing processes of many industrial products. Recently, Dohm Ltd., 167 Victoria Street, London, S.W.1., introduced a metallic abrasive for shot-blasting, available as either "round shot" or "angular grit."

The makers claim that the much longer life of metallic abrasives make them better for use as graded particles, and this in turn gives a more uniform cleaning blast. Because of the greater intertia of the metallic abrasives when compared with sand, for example, nozzle wear and replacement is very much reduced.

Another advantage claimed for the metallic product is the absence of the silica dust which can be such a serious health hazard to operators.

Both the shot and the grit are available in a wide range of particle sizes, and the makers say that they will be pleased to advise where these should be used.

Tack Rags

THE range of tack rags manufactured by A. D. Tack Rags and Adhesive Dusters Ltd., P.O. Box No. 28, Kates Hill, Dudley, Worcs., has now been extended by the addition of another type, Type 42, to the previous range which is designated Type 51.

Both will be available in a choice of impregnations, coloured either white or yellow, in a choice of sizes. The standard size is 18 in. x 34 in. and the double is 36 in. x 34 in.

The method of packing has also been revised, and all types and sizes are now available, ex stock, in either pull-out packets of a dozen, or in cartons of a gross.

Characteristics of the tack rags are: there is no drying out or hardening, and they will not generate heat in storage and are therefore proof against spontaneous combustion. Each rag is folded to give 32 working surfaces.

Stainless Steel

A PATENTED type of stainless steel capable of withstanding the heat barrier encountered in high speed flight has now been perfected by Firth-Vickers Stainless Steels Ltd., Sheffield.

The new steel, known as F.V. 520, is suitable for both airframe and skin purposes, as well as for a variety of industrial applications. The makers claim that it is the only austenitic type of stainless steel that can be hardened by low-temperature heat treatment.

The new steel promises to be a substitute for titanium, which although offering exceptional qualities of heat resistance, is expensive, difficult to produce and work, and comparatively weak in strength. The new stainless steel combines high strength, low thermal expansions, and corrosion resistance.

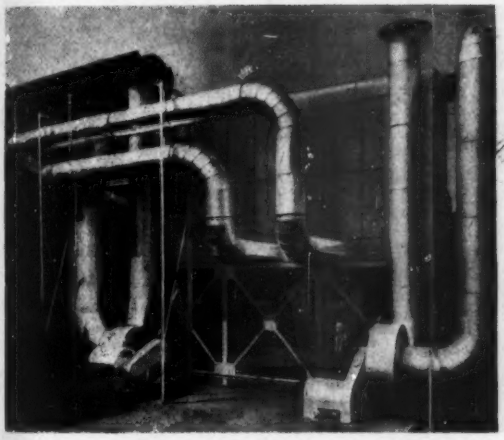
The makers say that test samples of F.V. 520 immersed in sodium chloride for one year were practically unaffected. Unlike most stainless steel capable of being heat-treated to a relatively high tensile strength, F.V. 520 can be readily welded without pre-heating. There is no tendency to peak hardening in the heat-affected zones, and there is little danger of cracks forming. Maximum hardness adjacent to welds is of the order of 320 Brinell. No heat treatment after welding is necessary, although a post-weld heat treatment at 550°C. can be used for relieving stress.

(*Continued in facing page*)

A. E. GRIFFITHS (SMETHWICK) LTD.

PROCESSING TANKS

For many years we have designed and constructed Tanks of all sizes and types for industrial processes and for storage. Tanks made of mild steel, stainless steel, heated and insulated, galvanised, metal sprayed, lined with rubber, lead or P.V.C. We also fabricate Tanks from glass fibre with various resin combinations for special requirements.



DUST COLLECTING

The choice of extraction equipment depends on a number of factors, i.e. size and nature of dust ; value as a by-product ; degree of efficiency required and space available for the erection of plant. Our intensive research into the control of many forms of industrial dust has enabled us to design and manufacture large and small installations suitable for a wide variety of industries. Send us your problem on dust collection and separation.

INDUSTRIAL OVENS

For a better finish to your products you need a Griffiths Oven. Our Box Ovens, for tray, trolley or suspension loading, and Conveyor Ovens, for a continuous processing op[illegible] give you maximum e[illegible] economy in labour [illegible].

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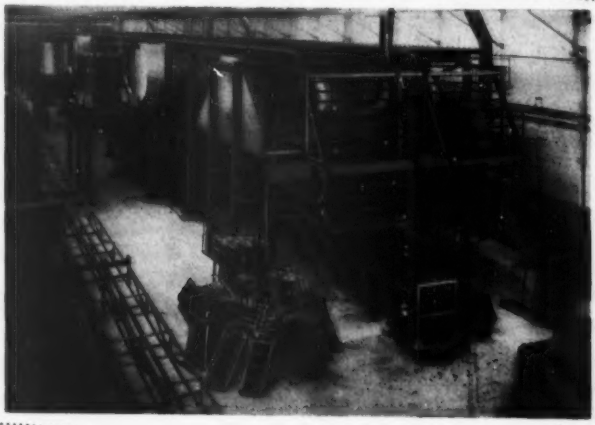
INDUSTRIAL OVENS



BALLARD
THE NAME-CONVEYING-OVENS

BALLARD & CO. LTD. TIPTON ENGLAND

Photograph by courtesy of Rolls-Royce Limited

More wear resisting than Tungsten Carbide

C.T.B SHOT BLAST NOZZLES

Glostics Ltd

AGENTS:
IMPREGNATED DIAMOND PRODUCTS LTD . TUFFLEY CRESCENT · GLOUCESTER

METAL FINISHING

—A QUESTION OF ECONOMICS

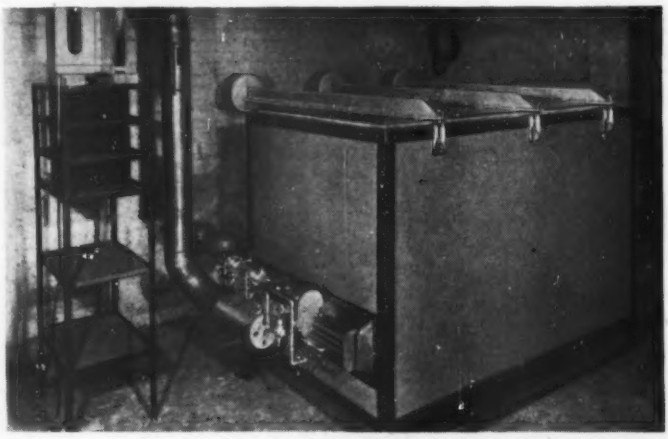
MOST metals are extracted from ores, usually the oxides of those metals. There is a tendency for the metals—exceptions being the noble metals—when exposed to return to their oxidised state.

This is the basis of corrosion, i.e. the rusting of steel and ferrous metals and the oxidising of non-ferrous metals.

All metals therefore need protection from the air and its moisture. This protection is given by various finishing coats.

Metal finishing fulfils a dual purpose—it protects the metal from corrosion and it provides an attractive finish. The importance of quality is still often overlooked, although—no matter how good the product, no matter how much it crystallises technical ingenuity—customers will not wear a path to the sale room door to see a drab unattractive product.

The cost of metal finishing may be quite considerable, in many cases exceeding the cost of the unfinished article. The finish on a motor car, a sewing machine, a refrigerator or a gas cooker, is an intrinsic part of its sales appeal. In all finishing processes—whether enamelling, electro-plating, galvanizing, metal spraying, phosphating, anodising—invariably at some stage in the process the question of heating tanks of liquid or baking a finish arises. In short, fuel is needed.



Immersion Tube Heating. Development towards more efficient heating has led to the wider application of immersion tube heating. Hot gases are passed through tubes fitted into the tank, completely surrounded by the liquid to be heated. The advantages of such a system are many, and when new plant is required it is advisable to give consideration to this method of heating, for with such a system it is much easier to insulate all the exposed surfaces of the vessels. Most important of all, efficiencies have been raised to the order of 60/65%.

Galvanizing. Through much study, a number of special gas heating systems have been designed and developed to ensure even heating and maximum bath life, whether for continuous wire galvanizing (illustrated) or varied jobbing work. Gas-fired plant, fully insulated and with the latest automatic control equipment, is producing economically, reliably and consistently, hot dipped galvanized wire meeting exacting requirements. (Photograph by courtesy of Richard Johnson & Nephew Ltd.)

E.C.3

Gas is readily available in the factory; the quantity used can be easily measured on an industrial meter; it is of constant supply and declared calorific value; it can be easily applied for all heating purposes.

All these qualities have led to the adoption of gas, a clean, convenient heating medium.

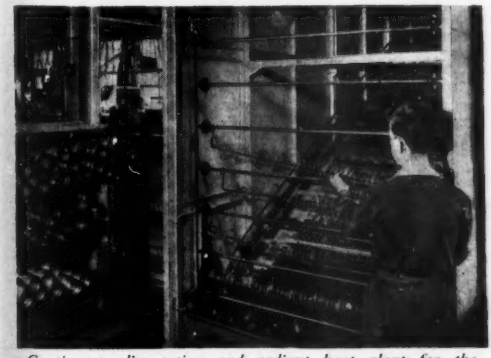
Gas Economy

However, there is more in economic gas heating than leading a gas flame underneath a tank. Even today gas is used uneconomically, for the waste heat from a finishing shop employing unlagged and uncovered tanks can be considerable. There is no excuse for unlagged and non-insulated tanks — no manufacturer can afford them! However, any fuel requires the correct proportion of air to realise its total combustible and heat-giving content. Therefore every consideration must be given to the correct design of burner and air supply. Let us consider some vats installed by a Gas Board for anti-rust treatment of metal parts before storage. They are 1′ 6″ x 2′ 6″ x 2′ deep, with a capacity of 50 gallons. Each is insulated with 1″ of asbestos, and a suitable burner is thermostatically controlled. The rest of the equipment includes a low pressure shut off valve and a constant pressure governor. The tanks operate at 170°F and at night are covered to reduce heat loss. The average consumption of gas per day for the three tanks has been only 2.1 therms. Without these precautions the gas consumption for the same service might be 6 therms or more!

Whatever the finishing process, Industrial Gas Engineers at the Gas Boards have spent much time in determining the most economical fuel utilisation. They pool their knowledge so that any manufacturer wishing to improve his product finishing line can obtain, quite freely, advice from the Industrial Gas Engineers at his Area Gas Board.

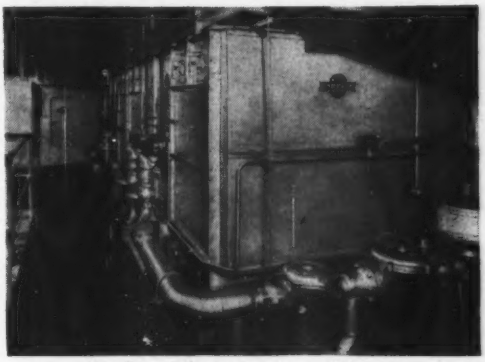
Gas is a refined, smokeless fuel, and its waste is neither advantageous to the national economy nor to the industrial manufacturer.

An important function of the Industrial Gas Engineers is their continuous effort to reduce fuel usage in relation to output.



Continuous dip-coating and radiant heat plant for the combined enamelling and heat treatment of furniture springs.

The oxy-coal gas flame is used for spraying both metallic and non-metallic materials. The illustration shows pistol-spraying of a thermoplastic resin.
(Photograph by courtesy of D. Napier & Son, Ltd.)



Gas-fired air heaters serving varnish ovens.

References

Scottish Gas Board, Edinburgh
Northern Gas Board, Newcastle-upon-Tyne
North Western Gas Board, Manchester
North Eastern Gas Board, Leeds
East Midlands Gas Board, Leicester
West Midlands Gas Board, Birmingham
Wales Gas Board, Cardiff
Eastern Gas Board, London, S.W.1
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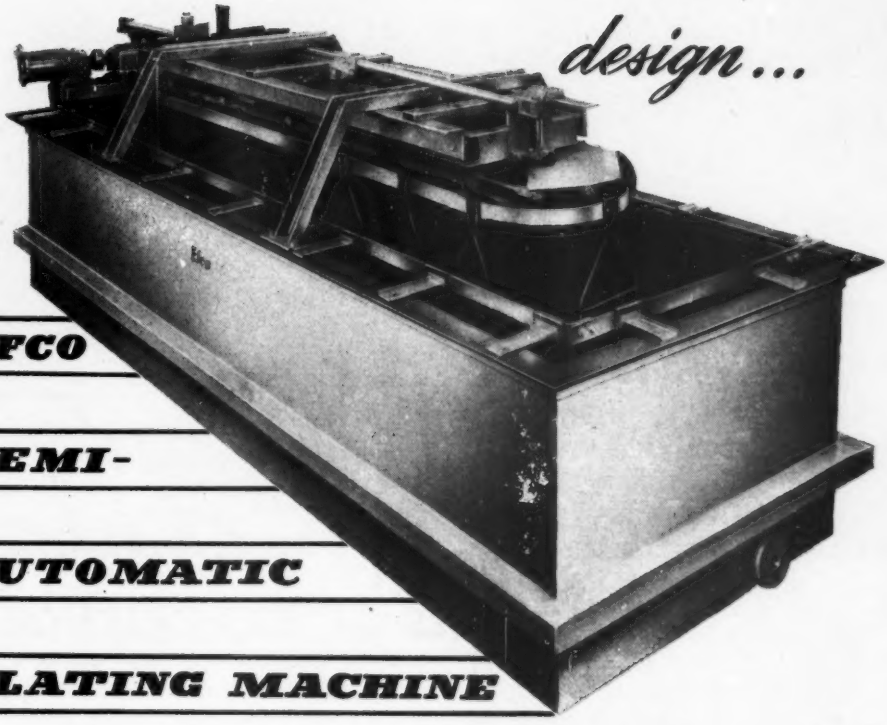

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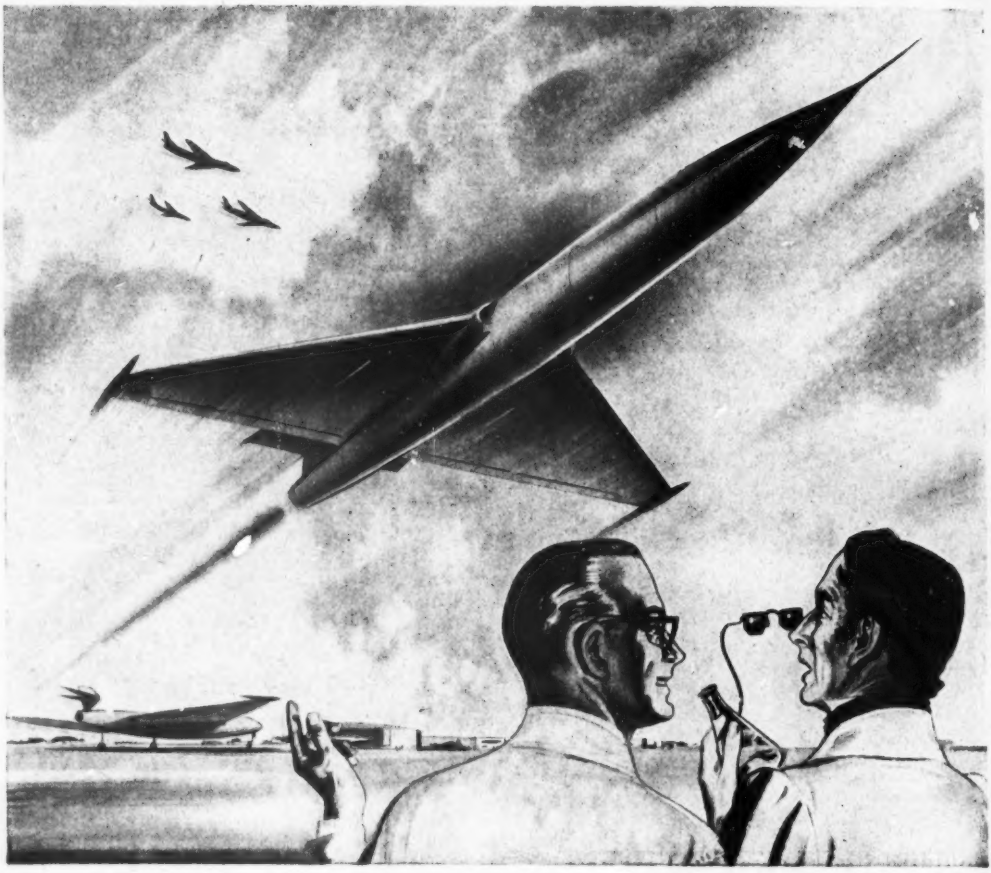

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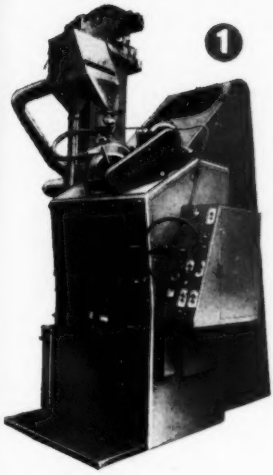
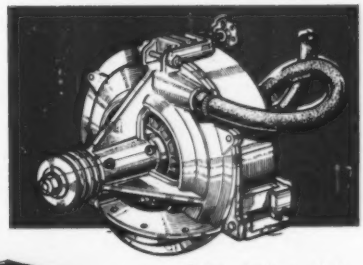
Shot Blast Equipment

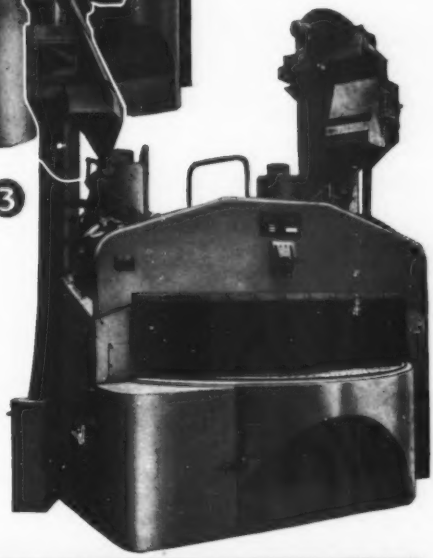


This A-S-L Turbine is the most modern Airless Shot Blasting Unit available. The bi-phase injection system enables shot to be projected at greater speeds using lower power with fewer replacements. The economies effected in spare parts alone are very substantial.



Baker Perkins High Speed Bi-Phase A-S-L Turbine, British Patent, No. 510681.

These machines do not require pits or special foundations.



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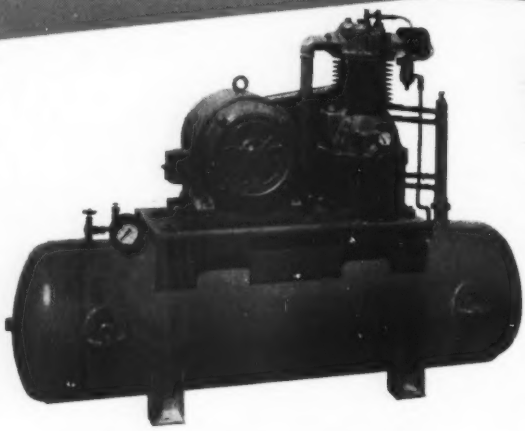

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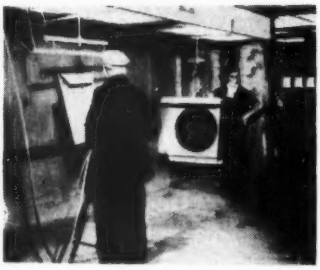

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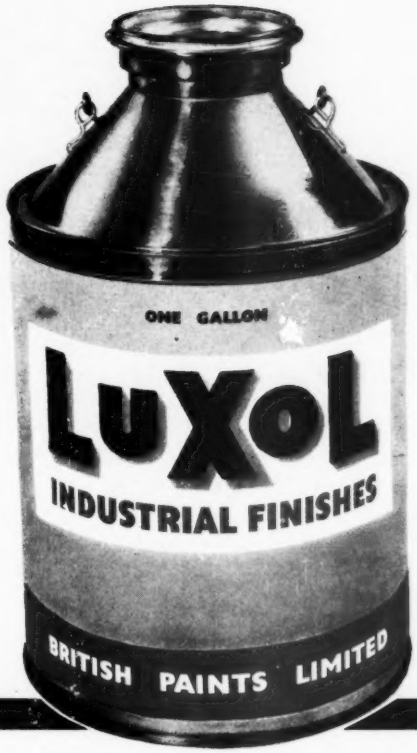

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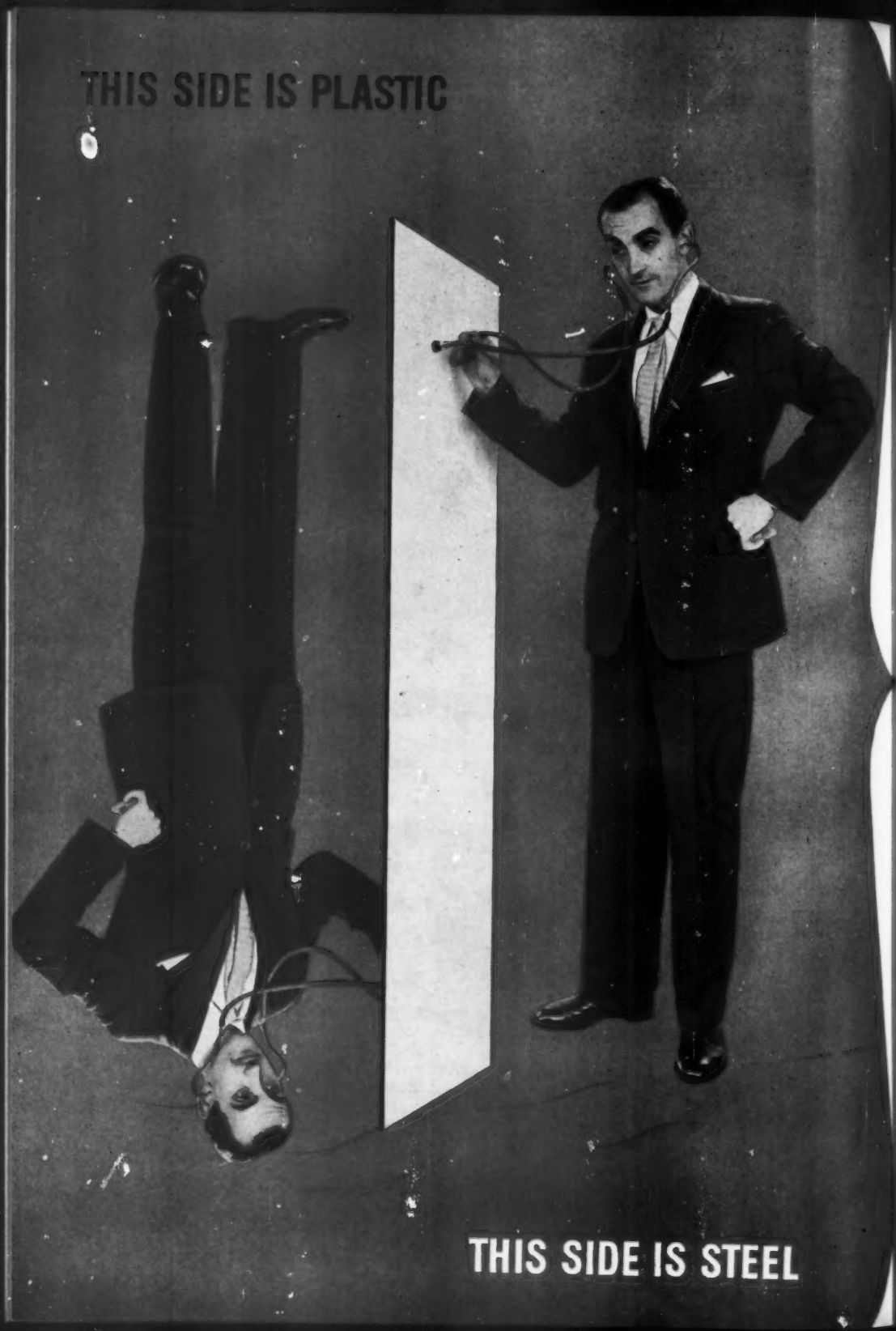
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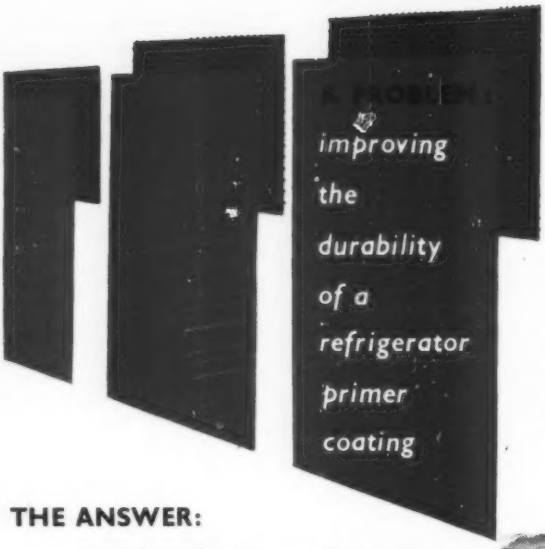

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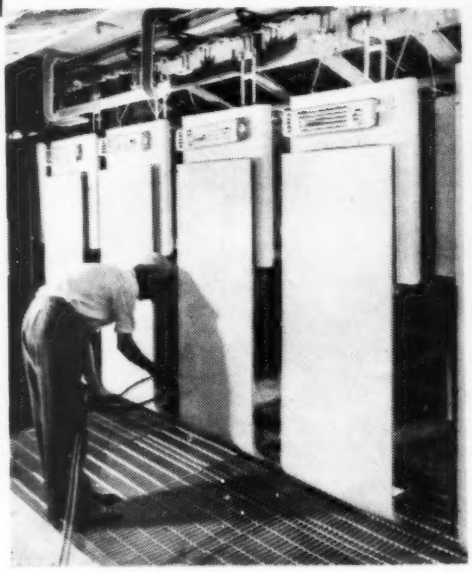

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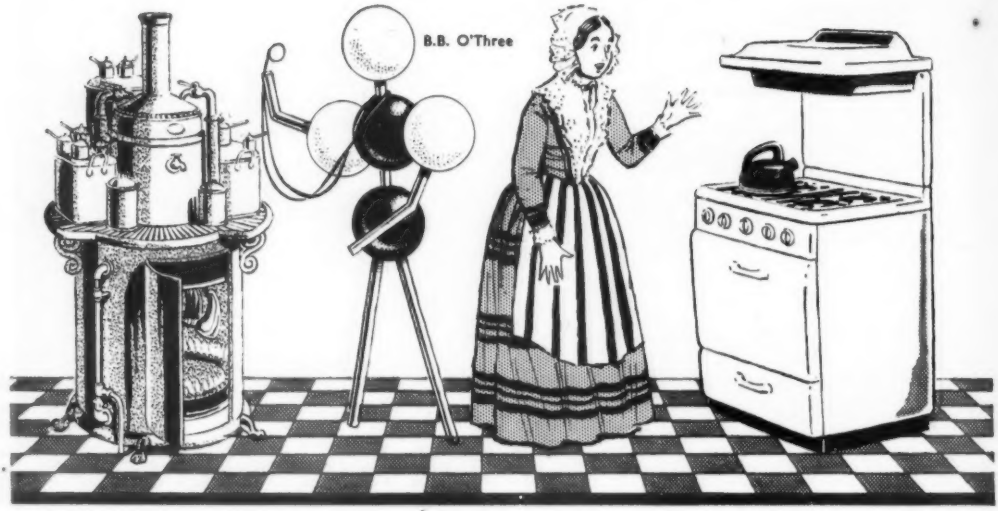

Ever since the eminent inventor Mr. James Sharp exhibited his first practical 'gas cooking apparatus' in 1851, gas cookers have continued to develop both in cooking efficiency and in appearance. Through the years the trend in gas cooker design has more than kept pace with modern labour-saving ideas. The introduction of attractive, easily-cleaned vitreous enamelled surfaces was a major advance. Innovations such as safety taps and self-lighting burners have more recently been followed by glass oven doors, eye-level grills and automatic oven controls. Today, any housewife would be proud to own a cooker with these features and, as 3 out of 4 housewives cook by gas, there is a very large potential market, both for replacements and new sales.

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(Continued from previous page)

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PATENT

The Proprietors of British Patent No. 697904 are prepared to sell the patent or to licence British manufacturers to work thereunder. It relates to a Method for Fixing Glass Lenses on Vitreous Enamelled Boards. Address : Boult, Wade & Tennant, 112 Hatton Garden, London, E.C.1.

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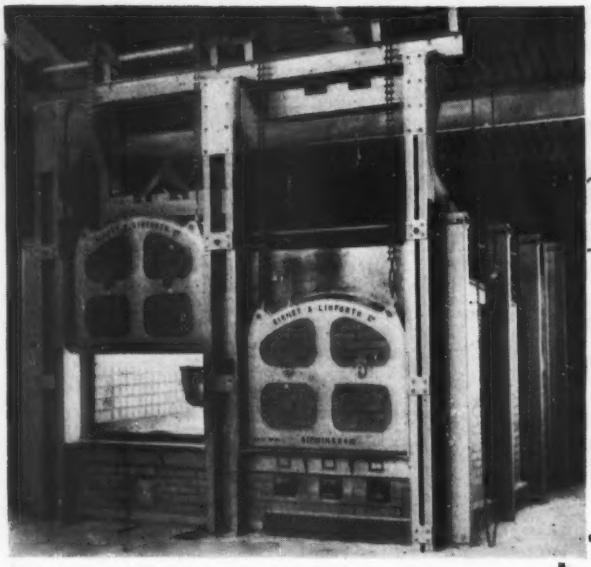

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